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Conveyorized Welding

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AUTOMATIC household refrigerators are so well known and widely used today that they have become a necessity in many homes where they once were considered a luxury. Comparatively few of those utilizing modern domestic refrigerators realize the extent to which welding has been used in their manufacture. Fabrication of almost any of the high-grade units would be extremely difficult without welding. The Electrolux refrigerator more than any other depends on welding. In fact, it might be said that to build the Electrolux would be almost impossible were it not for gas welding, and in particular oxy-acetylene welding. The characteristics of Electrolux are such that there are serious obstacles in one's path if he attempts to apply any of the other known types of welding to many parts.

Of the two general types of refrigerators in common use, compression and absorption, the Electrolux comes under the latter classification. The feature of the compression refrigerator is a mechanical compressor for compressing the refrigerant gas to a liquid which is permitted to expand, producing the refrigerating

From a paper presented before the American Welding Society.

Tack-welded units are held in ordinary bench vises on a continuous conveyor moving at 5 ft. per min. Final welds are made with oxy-acetylene torches as the units pass the operators

effect. The expanded gas is compressed again, completing the cycle. Well-known examples of this type are found both in the small size or household refrigerator and in the industrial or ice and cold storage plant. In the absorption type the power-driven compressor is replaced by an absorbent and a source of heat. This is exemplified by Electrolux in the household field and numerous large installations in the industrial field, especially where low temperatures are required or where ample steam is available.

Tight Joints Required

The most essential factor in uninterrupted operation is permanent tightness in all joints, since the exactly proportioned refrigerant fluids are put in under a definite pressure, and the smallest leak would quickly lower the efficiency of the unit, soon stopping its action completely. This means that not only must the unit be welded with the greatest of care, but it must also be carefully tested for leaks after welding, and any leaks found must be repaired. In addition, since the unit contains hydrogen gas at more than 200 lb. pressure, as well as ammonia and water, the system of testing must be such as to detect the most minute pinhole in any of the welds or other locations.

About 40 per cent of the personnel in the entire production department of the Electrolux division operate welding torches, consequently a description of the major manufacturing operations will show but few steps where welding is not concerned. As an introduction, however, a description of the unit will make quite understandable the reasons for fabrication by welding. Each unit consists essentially of seven parts known as the generator, liquid heat exchanger, absorber, condenser, rectifier, gas heat exchanger and evaporator. The unit is composed almost entirely of tubing and drawn shells of various diameters. Its design is such that it will stand a pressure of over 3,000 lb. without bursting. This excessive strength is needed for test purposes only.

There are 78 individual welds in each unit, making a total of approximately 150 in. of welding in metal ranging from No. 17 to No. 11 gage. Most of the parts are made from seamless steel tubing and deep-drawn steel shells.

To give some idea of its size, the largest unit made for domestic purposes fits into a space of 3.2 cu.ft., 5½ in. in depth, 19 in. in width, and 52 in. in over-all length. The flow sheet below summarizes the essential steps in the manufacture of the unit:

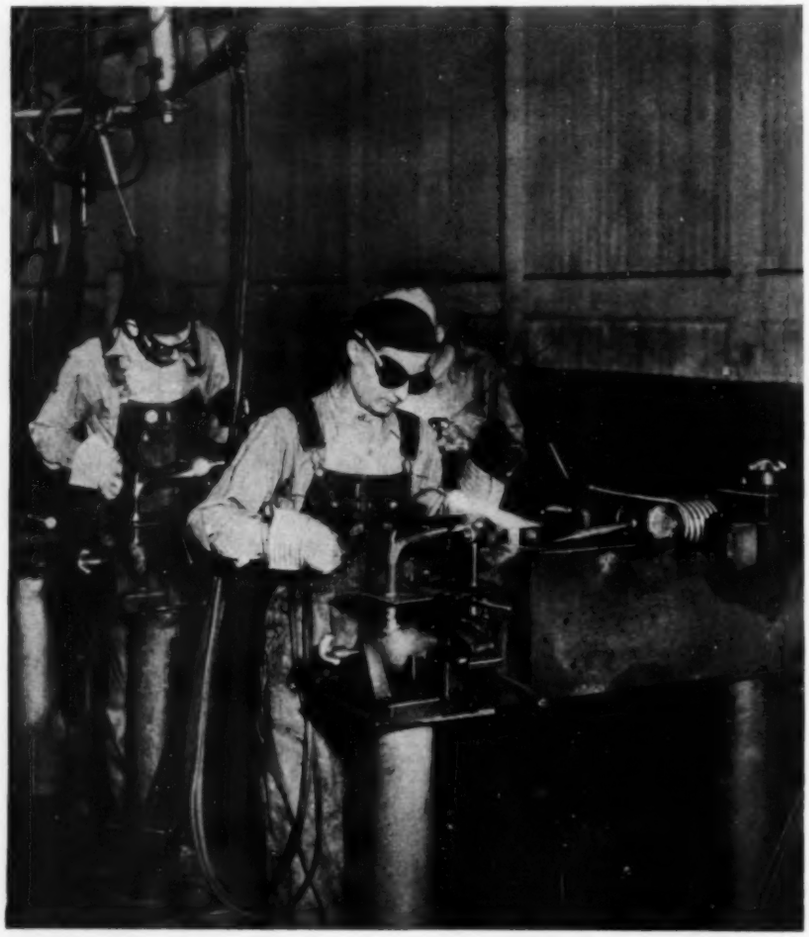
Raw materials—cut to length, clean if needed, bend, form, drill or otherwise fabricate, clean, sandblast—welding—leak test and repair—pickle and galvanize—assemble into insulation box and charge unit—calorimetric test for capacity—final assembly of accessories to unit—installation in cabinet.

In view of the fact that the unit must have long life, the utmost care must be exercised in the selection of raw materials used and in their fabrication. The tubing and steel used falls within the following analysis:

Carbon	0.08-0.14	Sulphur	0.05 Max.
Manganese	0.30-0.60	Silicon	0.05 Max.
Phosphor	0.05 Max.	Copper	0.05 Max.

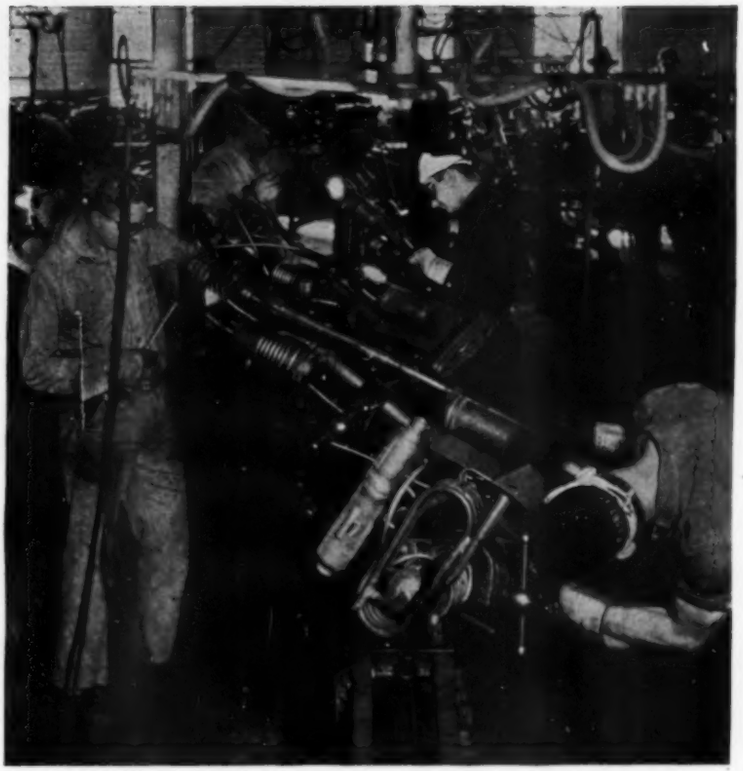
The analysis was set up to give a good welding steel, soft enough to be fabricated into the intricate bends and coils required. The tubing is retort annealed (to lessen scale formation) to a maximum tensile strength of 51,000 lb. per sq.in. The welding rod used falls within the American Welding Society's specification No. G-1A in analysis, but the analysis alone is not sufficient to define a suitable rod. Freedom from inclusions, gas bubbles and scale is necessary also to get leak-proof welds. The percentage of leaks found on test goes up immediately if a shipment of inferior rod is used.

The acetylene for welding is supplied by a low-pressure non-automatic acetylene generator with a carbide capacity of 500 lb. and an hourly rating of 3,000 cu.ft. of acetylene. The generated gas is not turned directly into the supply line as is done when an auto-



Channel-iron fixtures built up by welding are used in subassembling on benches at right angles to the conveyor line. The tack-welded assemblies may thus be returned to the line without difficulty

matic feed generator is used, but first conveyed to a large storage holder with a capacity of 2,000 cu.ft. of acetylene. The feeding of the carbide to the generator can be started or stopped as desired. As the time required for charging is less than 20 minutes, there is always ample time to replenish the supply in the storage holder adequately to meet shop demand, assuring an uninterrupted supply at all times. This is important where a conveyor system is used, because a hold-up would cause serious disruption in production. Oxygen is piped to the plant from a conventional 40-cylinder oxygen manifold so arranged that only twenty cylinders are feeding to the line at one time, the other twenty being held in readiness to be connected to the line immediately when the first twenty have been exhausted. The oxygen pressure is held to approximately 27 lb. per sq.in., and the acetylene at about 14 in. water column pressure (9 oz. gage). Close attention was given to the proper design and erection of the new oxygen and acetylene piping systems so there would be no cause for interrupted service from this score. Valuable assistance was rendered by the engineers of the company supplying our oxygen.



Swiveling vises mounted on dollies on the conveyor make it easy to shift the assembly to any convenient position for welding. Note the new head arrangement of air and gas lines

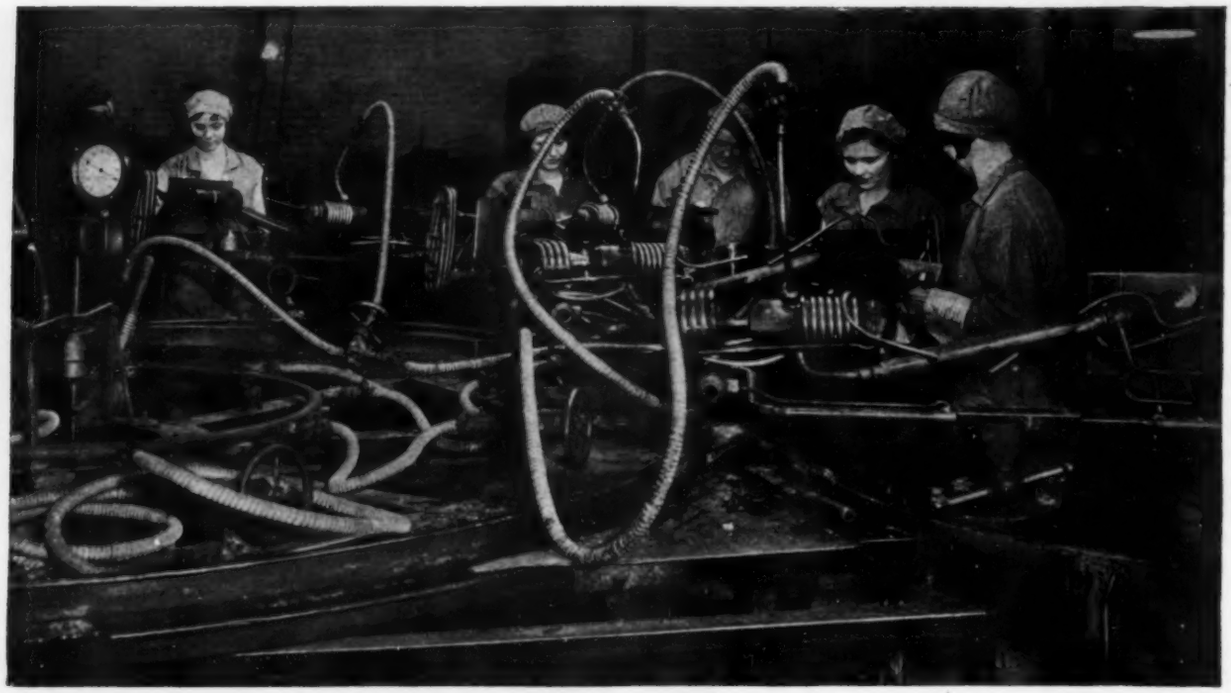
After the cutting operations have been performed on the rough stock, consisting mostly of tubing, any forming necessary is done with the aid of special bending fixtures and machinery. The necessary holes are drilled or punched and all burrs are carefully removed. After the parts are washed and steamed to remove all grease, they are put through a sandblast operation using steel grit as the abrasive agent, and are then ready for the welding department. When two pieces of tubing are welded together they are always formed or machined to fit closely so that a minimum of bridging over is required of the welder. It is found this minimizes leaks; also, where possible, the unit is designed to make it unnecessary to make one weld overlap the second.

Originally all welding was carried out using stationary tables, passing a part from one table to the next for subsequent operations. Heavy fixtures are used into which the welder cannot force a piece of incorrect dimensions. All parts are tack welded together in the correct relationship in these, then taken out for finish welding. This finish welding was formerly done in stationary vises. Frequent expansions of manufacturing facilities have been made since this refrigerator was first placed on the market, and toward the end of 1930, the output has increased to an extent that manufacturing by a continuous conveyor was justified. So far as was known welding had never before been used for the fabrication of metal parts while moving on a conveyor.

Nevertheless, after consultation with various engineers it was decided that the plan was quite feasible, so the entire manufacturing process was coordinated to the new scheme and a conveyor was placed in operation. It was, of course, necessary to continue production while the system was being installed. As fast as one section of the new production line was put into operation, the old section, which took care of that particular manufacturing operation, was removed to make room for new equipment. All this was completed with but little disturbance to the manufacturing schedule, particularly since the changeover was made during the slack period in our yearly production cycle.

The flexibility of welding as a manufacturing tool had been clearly demonstrated in all previous expansions of the plant. It was merely necessary to train new welders, which was done in the school operated in conjunction with the welding department, provide new welding stations which are relatively inexpensive, and install and provide other miscellaneous equipment, such as jigs, which was readily made in the plant.

Because of the constantly increasing expansion of the welding department, it has been found valuable to operate a welding school as an adjunct to the factory. Some experienced welders are obtained locally, but as a rule it has been found more satisfactory to train men who have never done welding before. The capability of the apprentice welder, when first put on a production job, can quickly be determined by the leak tests, in which all welds are examined with soapy water while the unit is under 950 lb. per sq.in. of air pressure. This is much greater than the operating pressure, but it only amounts to about a third of the bursting strength of the weakest part of the system. This test is an excellent barometer of the capabilities of all operators and apprentices. The more experienced welder will have on an average about 3 per cent of leaks reported back to him. The apprentice welder when first put on production work will quite naturally have a much larger percentage of leaks. Each operator is assigned to a particular weld, and it is an



Four consecutive tests are made on each unit, a welder making necessary repairs between tests

easy matter to keep a complete record of his work. This is done by the leak testers who record the particular welds that are found leaking.

By this method all the welders are inclined to do their best work. Women quickly learn the technique of welding. Many have been trained for the lighter and more tedious jobs, and on this class of work, they have worked out more satisfactorily than male welders. In training welders, bridging is taught rather than penetration. This is to prevent the welders from melting through small pipes and closing or partially closing them, thus interfering with the operation of the unit. Welders are first taught on scrap plate material. They are then put on simple sub-assembly welds, and are given more complicated welds as they become more adept. The best welders are used for repairing leaks found in welds previously made.

Making the Fixtures

On some occasions, when inexpensive fixtures of a temporary nature are desired, a sample of the particular unit will be carefully made up and used as a model for building a fixture. A steel plate about $\frac{3}{8}$ in. thick and of the desired size, reinforced with channel iron to prevent warping while welding, is used for the base of the various locating V-blocks and saddles. V-blocks and saddles are usually made from channel iron sawed to the desired length and shape. All of these parts are placed in position and welded to the baseplate, making an inexpensive fixture that can be used for several thousand jobs.

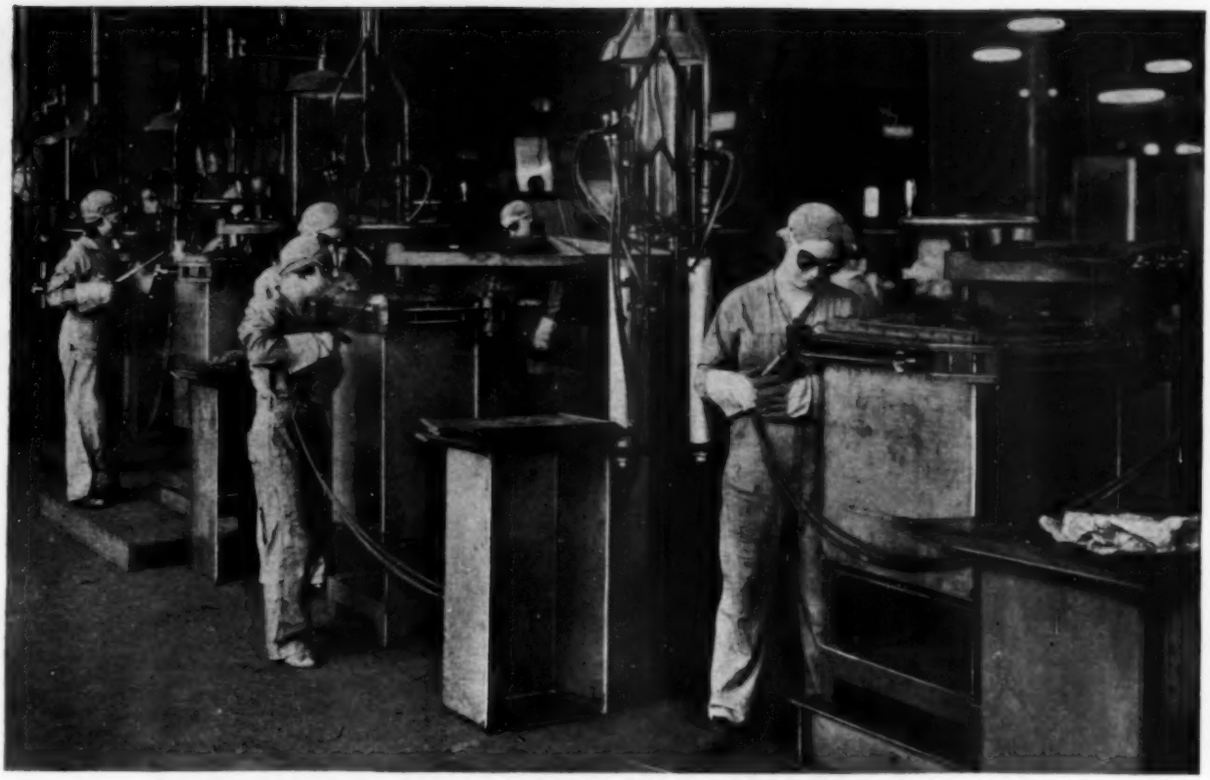
The welding department is laid out with the sub-assembly benches for tacking the parts together at right angles to the conveyor line. The conveyor is designed to travel along the line of production at a rate of 5 ft. per minute for maximum production. Every 4 ft. along the conveyor chain is a swivel vise for holding the work which is carried along on a small dolly supported by a fixed rail. Consequently, one unit every 48 seconds, or 75 units per hour, can be turned out when necessary.

The first part of the unit to be placed on the conveyor after assembly by tack welding is the gas heat exchanger. A sufficient number of operators are assigned to weld on this part, so that each can finish welding his weld easily in the allotted time. Welding tips are specified for the weld to be made, and low constant-pressure acetylene assures the foreman that the welder uses the correct size flame. At a point where the welding has been completed on the gas heat exchanger are the tacking tables and fixtures for the evaporator shield plate assembly and the absorber assembly. These last-mentioned items are placed on the conveyor to ride to a point along the line where several first major sub-assembly tacking fixtures are located. They are then all removed from the conveyor for tack welding into a sub-assembly, and a tack-welded sub-assembly put in its place.

The finish welding is divided among the various operators and completed as before. At a point where these operations have been completed are located the sub-assembly lines of the condenser, the rectifier assembly, and the generator and liquid heat exchanger assembly. These lines run parallel to the conveyor and ride to a point where the conveyor makes a U-loop around the second or final assembly welding fixtures. There they are taken off for tacking, and the operation is repeated as before by placing the unit back on the conveyor for finish welding.

Following this, the complete unit is put through a straightening fixture to correct warpage caused by welding. Four consecutive leak tests are made, with a welder making the necessary repairs between each test. Three of these tests are with 900 lb. of air sealed in the unit for periods ranging from 5 to 15 minutes. If a leak is present, it will surely show up as a bubble, or as slight foam if the leak is small, in the soap solution poured over the welded joints.

After brazing the copper lines together and to the absorber, the assembly is removed to an overhead con-



Women quickly learn the technique of welding and are used on lighter and more tedious jobs. Here the refrigerator liners are being welded

veyor where it is put through a pickling and galvanizing process. Then the copper coil is soldered tightly to the absorber for better heat conductivity. Oxy-acetylene blowpipes are used for all soldering operations. At this point, the assembly has traveled 1,021 ft. on three conveyors, and the elapsed time is 3.4 hours.

Before the refrigerants are charged in, however, all parts of the unit from which it is desirable to prevent heat loss during operation are inclosed by a galvanized steel casing packed with mineral wool insulation material The unit is then evacuated and charged with the required amounts of ammonia, water and hydrogen gas while moving on the conveyor. After this operation, the unit leaves the conveyor and is placed on a stationary test rack where it is given a calorimetric test of several hours duration for refrigerating capacity.

The test is carried out by introducing a definite amount of heat into the boiler and reading the temperature of the refrigerating compartment or evaporator when working under a known heat load. This temperature is compared to that obtained on a standard capacity unit operating under the same conditions.

After the "cold" test, the units are placed on another conveyor for final assembly, where they are equipped with the aluminum chilliator casting, gas burner, gas thermostat, and water control. The unit is then given a general inspection and placed on an overhead conveyor carrying it to the cabinet department where it is removed and installed in the cabinet on another conveyor.

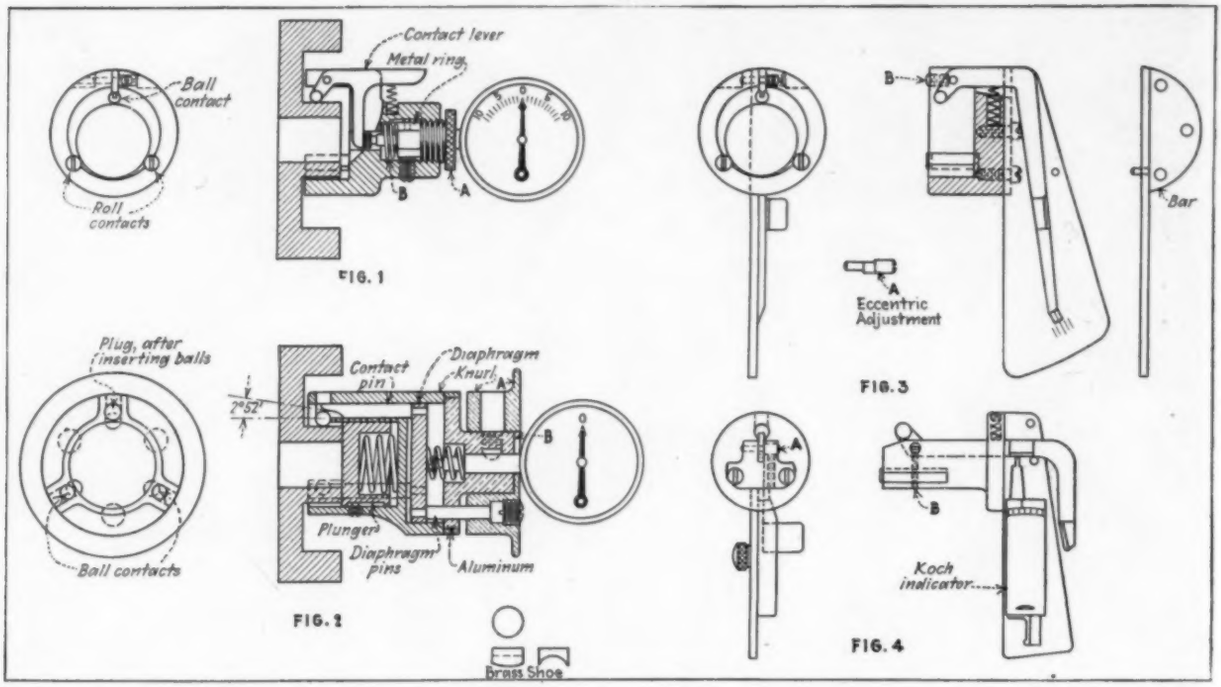
Although the oxy-acetylene welding of the Electrolux unit constitutes the major proportion of the welding on the final product, the discussion cannot be complete without some mention of the welding of the cabinet and of the few points where it has been found advantageous to use electric welding.

The top and bottom of the refrigerator liner are welded to the sides clamped in stationary fixtures. The liner is made of Armco iron. Girls do the welding. The edges are melted together with the torch. No filler rod is used except in rare cases, when the filler material is the same as the work. Particular care must be exercised to keep the edges clean, so that a weld free from pinholes is made, because pinholes will frequently cause defective porcelaining.

Electric Welding Operations

As regards electric welding, there are two operations carried out on the unit which might be interesting to mention. The insulation boxes are of galvanized iron and are electrically spot-welded together. The absorber and evaporator caps are welded on, using an automatic metallic arc welder.

In conclusion, it can be said that the benefits which have resulted from the adoption of the conveyor system of production have been ample repayment for the expense of the changeover and the investment in new equipment. Lost motion in handling and stacking the various sub-assemblies and the completed units has been almost entirely eliminated, and the welding efficiency has been greatly increased. There has also been a decline in the percentage of leaks, even though the welding is done while the work is moving. It has been found that the movement or the speed of the conveyor is not detrimental to quality work. However, the operation of the conveyor should be smooth and without any irregular motion. The most gratifying result to the management, however, has been that the oxy-acetylene welding process was so readily adapted to the conveyor system, and that production could thus be increased by 50 per cent with but a 20 per cent increase in the number of operators.



Gages With Three-Point Contacts

WM. C. BETZ

Master Mechanic, The Fafnir Bearing Company

IN THE MANUFACTURE of certain articles, a part known as a spider must be machined to close limits, as the trunnion diameter has to be a light drive fit in the mating part. Because each of these pieces has an overhanging shoulder, or shroud, it cannot be measured as readily as can a plain cylinder, therefore the gages illustrated were designed.

A lever type gage employing a dial indicator for registering the size is shown in Fig. 1. This gage has two hardened rolls in the body and a hardened ball in the lever for contacts. It is set to size by the knurled adjusting screw *A*, which bears against a metal ring sweated on the lever end of the spindle of the indicator. The ring is sweated on the tube after the adjusting screw has been slipped over the tube. The indicator tube is kept in end tension by the helical spring *B*, against which the tube and the ring abut. After the indicator has been set to size, it is locked in place by a setscrew.

A gage having a dial indicator and employing three steel balls as contacts is shown in Fig. 2. It is kept in true relation to the center line of the work by a plunger that is brought into contact with the end of the work. This gage will indicate tapers as little as 0.0001 in. when used as follows: The gage is held by the knurled section between the thumb and the index finger of the right hand, the little finger resting against the shoulder of the end flange *A*. By exerting a little spreading pressure with the hand, the diaphragm carrying the three contact pins is drawn back, releasing the pressure on the three balls. The gage may then be located in any position along the length of the work. Upon releasing the tension on the flange *A*, the pins again make contact with the balls, and a reading is taken on the indicator.

In making this gage, the diaphragm with the contact pins riveted in place is strapped to the faceplate of a small grinder and the angle of 2 deg. 52 min. is ground on the ends of the pins. This angle gives the diaphragm a movement of 10 to 1 of the radial movement of the balls. Adjusting the dial to zero is accomplished by sliding the indicator back or forth in the end piece *B*. It is locked by a screw that is accessible through a hole in the flanged end-sleeve.

A plain lever-type gage having cylinder and ball contacts is shown in Fig. 3. This gage has a multiplication of the lever of 30 to 1, and is easy and inexpensive to make. Great care, however, should be exercised in boring the roll holes parallel with each other, for if they are not parallel, the reading will indicate a difference in the diameter of the work as the gage is slid back and forth, although the work is parallel.

The gage shown in Fig. 4 is for internal use and is made on the same principle as the one in Fig. 3, both gages being adjusted for wear by the eccentric rolls *A* and *B*. The rolls in the gages in Figs. 1, 3 and 4 are made two in one piece and are notched in the middle. After hardening, they are ground by alternately holding the ends in a chuck, being finished by lapping, after which they are cut apart by an elastic-bond wheel. These rolls must be a good friction fit in their holes, so that they may be turned to new positions by a screwdriver as they wear. They may thus be used in at least six positions before losing their accuracy in the holes.

The heads of all the gages are made either of machinery steel or brass, the roll holes being bored in the solid. The end clearance holes in the gages in Figs. 1, 2 and 3 are bored to cut through and expose part of the roll surfaces. The handles of the gages in Figs. 3 and 4 are cold-rolled steel having ears bent to 90 deg., as shown at the right in Fig. 3. The ears have three holes for screws for attaching them to the heads. The levers carry hardened steel balls, each of which has a slot ground in it to facilitate soldering it to its lever.

The gages in Figs. 1, 3 and 4 are held in the right hand, using the thumb to operate the levers. The gage in Fig. 1 is operated by pressing down on the end of the lever. In the gage in Fig. 3, the lever is moved to the left, while in the one in Fig. 4 it is moved to the right to pass over and into the work. The springs in the gages in Figs. 1, 3 and 4 keep the lever contacts in touch with the work at a constant pressure. The external gages in Figs. 1, 2 and 3 are set to standard plugs, while the internal gage in Fig. 4 is set to a standard ring.

NEW BOOKS

MANUAL OF ELECTRIC ARC WELDING—*By E. H. Hubert, Editor. 163 pages, 6x9 in. Clothboard covers. Indexed and illustrated. Published by the McGraw-Hill Book Co., Inc., 330 West 42nd St., New York, N. Y. Price $2.*

The need for a manual of this kind has been growing steadily with the increase in applications of arc welding. Sponsored by the welding section of the National Electrical Manufacturers Association, this book presents the main facts for engineers, designers, executives and operators. It explains fundamentals of the processes, gives practical suggestions on performing various welding operations and enumerates applications. Included is a course of training exercises for the operator or the executive who must conduct a welder's school. Plentifully supplied with illustrations, tables, and diagrams, the text is clear, concise, and readable. It is a practical authoritative work for practical men.

STANDARDS YEAR BOOK, 1932—*Compiled by the Bureau of Standards, U. S. Department of Commerce. Clothboard covers. 394 pages, 6x9 in. Indexed. For sale by the Superintendent of Documents, Washington, D. C. Price (Cloth) $1.00.*

Outlines of standardization activities and accomplishments of the Bureau of Standards and other agencies of the Federal government, the states, counties and municipalities, as well as of the technical societies and trade associations comprise the major portion of the book. A feature introduced this year is a symposium on communication research and standardization. The activities of international standardization bodies are covered as are also those of nations other than the United States.

In the letter of submittal, George K. Burgess, director of the Bureau of Standards, states that the year book "is proving of much value to manufacturers, industrial experts, and engineers as well as to purchasing agents, both governmental and general."

EMPLOYMENT AND UNEMPLOYMENT IN PRE-WAR AND SOVIET RUSSIA—*By Susan M. Kingsbury and Mildred Fairchild. 132 pages, 6¼x9½ in. Paper covers. Published by the International Industrial Relations Association, The Hague, and available from the office of the vice-president, I.R.I., 130 East 22nd St., New York, N. Y. Price $1.50.*

For those who are interested in the social and industrial changes that are occurring daily in the vast Russian nation, this books offers a clear and concise approach. Many tables of statistics are used to bring out the comparative data. The conclusions of the authors are that employment is rising, that productive capacity of the workers has improved, and that, in spite of the fact that certain classes of consumers have felt restrictions, the masses of the people have enjoyed an increase in consumer goods. The book is worth study in keeping abreast of the Soviet program.

HOYER-KREUTER TECHNOLOGISCHES WÖRTERBUCH.—*German, English, French technical dictionary in three volumes. 2,295 pages, 7¾x11 in. Published in Germany and available through The Industrial Press, 148 Lafayette St., New York, N. Y. Price, for the three volumes $55; for two volumes $37.50; for one volume, $19.50.*

Volume I of this dictionary has the German words alphabetically arranged with definitions in English and French. Volume II has English entry words with definitions in German and French, and Volume III has French entry words. The dictionary covers 100,000 words used in science, industry and commerce, and should be of assistance to anyone engaged in international trade or engineering.

PHOTOELECTRIC PHENOMENA—*By A. L. Hughes and L. A. Dubridge, department of physics, Washington University. 531 pages, 6x9 in. Illustrated and indexed. Clothboard covers. Appendixed. Published by the McGraw-Hill Book Co., 330 West 42nd St., New York, N. Y. Price $5.00.*

Intended as a reference work for research workers, students, and teachers, this book gives a critical survey of the whole field of photoelectric phenomena. Fundamental laws and principles in each branch of this fairly new field are summarized, together with a discussion of their experimental bases, their theoretical significance and their practical applications. It is one volume of the International Series in Physics.

Enormous advances in the field of photoelectricity and its practical application in numerous fields make this book a milestone. First of its kind, it provides a comprehensive treatment of the subject from the engineering point of view and is expressed in simple enough English so that those practical metal-workers faced with applications of photoelectric cells will find in it a valuable adjunct to their work.

EXECUTIVE FORUM

Square Pegs

In industry, as in all other phases of human endeavor, men will be found who just don't fit the jobs at which they are employed. Unquestionably this is a waste, but is it an unavoidable waste? Some feel that each man must shape his own destiny. If circumstances lead him into a vocation for which he is best suited, he is fortunate; if not, it is too bad. Can some scientific measure of aptitude be devised to avoid these mistakes and to cast men for roles in which they will be more successful and happier? Or is our present knowledge of the human mind and its abilities too limited to make this attempt? What do you think?

BOTH Douglas Palmer and Richard Carlson were interested in the human side of industry, but their viewpoints were often very widely divergent. Palmer, as works manager of the Cummings Electric Company, and Carlson, as personnel manager, sought the same end, that is, to maintain an efficient working force. But the means of attaining this end caused their difference of opinion. One day in the plant lunch room, the subject came up again.

"One thing these slack times have showed up very emphatically," said Carlson, "is the number of misfits in any organization. When things are booming, most men get by with their duties well enough. But now that pressure has been put on each man to do a little better, certain limitations are uncovered."

"That's true," agreed Palmer, "but I don't think we're any worse off than most plants. And besides, what can be done about it?"

"As I see it," said Carlson, "the trouble is not so much lack of ability, as it is having men in jobs for which they are not best suited. Most men have an aptitude for a certain kind of work, but more often than not, they are employed at something quite different. That's certainly a waste of man-power which should be corrected."

"Yes, I have an armature winder who ought to be a preacher," said Palmer, "and a number of others almost as badly miscast. But how can we keep square pegs from getting into round holes? If you solve that you'll do a great deal for humanity, but I doubt whether you can succeed."

"Several universities have taken up the problem," said Carlson, "and with some degree of success. They not only examine a man in his studies but endeavor to determine the vocation for which he is best fitted. It seems to me that industry could do something along the same lines."

"Only to a limited degree," said Palmer, "I have some men who shouldn't be in a manufacturing plant at all. Yet they do the work passably well. One of my lathe hands should have been a landscape painter. He dabbles around a little with it now, and I have seen some of his work. With some training, I believe he'd be happier and more successful as an artist than as a machinist. But I wouldn't want to take the responsibility of starting him on an artistic career."

"My idea would be to set up some sort of test to measure a man's aptitude," said Carlson. "Various measures of intelligence and ability have been tried. If we had something like these in the plant, we might learn a good deal about our personnel. Some of your foremen might make better tool designers for instance."

"Yes, and some of our officials might make better laborers," said Palmer, "but where would that get us? The only way I know of to fit a man into the shop is to try him out on different jobs. He may fail in one department and make good in another. It has worked out that way in a good many cases. I don't have much confidence in your psychological tests. All the children in the public schools used to be weighed to see whether they were too light for their ages. But some that the scales indicated were undernourished proved to be the most healthy. It's the same with an attempt to measure a man's capabilities. There are too many variables to permit the use of a rigid yardstick."

"You've substituted precision for cut-and-try methods on mechanical parts," said Carlson. "Some day we'll find a better way to evaluate men."

Discussions Of Former Subjects

Rolling Stones

The shop where I served a five-year apprenticeship had a ruling that when the apprentice became eligible for journeyman's wages, he was automatically discharged, which meant he had to win his spurs with another concern before being re-employed. It goes without saying that all concerned reaped the benefit. It is significant that with rare exceptions, the executive with long service in one concern is always at a disadvantage when circumstances rule that he be let out. His thought processes have become so set that re-adjustment to new conditions and environment is difficult. So far as the average plant is concerned, executive training courses are an expensive luxury. The man who is really ambitious will in nine cases out of ten get the required education through evening school or a correspondence course. Many companies recognize this fact by paying part of the tuition of promising men.

ROBERT S. ALEXANDER,
Universal Winding Company.

A young man recently out of college, whether his studies were along technical or commercial lines, obtains a broader viewpoint by occasionally shifting from one company to another. But it is also true that if a man changes positions too frequently, it will soon come to be that a prospective employer will look askance upon the man's record of frequent changes.

Most executives consider a low rate of labor turnover, both in the shop and in the office, to be desirable. If such is the case, bringing new life into an organization by replacing executives every three or four years is not a sound policy. Furthermore, if such a policy of replacement were sound, it follows naturally that the chief executive and his immediate associates are subjected to the same tendency toward stagnation, and should themselves be replaced every few years.

True, where apprentice systems for young executives are offered, more men take the courses than can be used later as executives. Some drop out of their own accord. Others are dropped by the company. Those retained after the training course is completed are the persons considered by the chief executive as most promising. Even some of these later will fall by the wayside.

To depend upon securing junior executives from the training courses of other employers, simply to avoid the annoyance and expense of maintaining such a course, is a selfish and narrow-minded policy and one difficult to imagine as the executive policy of a truly progressive organization.

WILLIAM C. WILLARD,
Chief Draftsman,
Buffalo Forge Company.

Enforced Retirement

Is management so shortsighted that it is not preparing understudies to replace the men who now occupy the executive positions? And if so, what provisions are taken to carry on when sudden death deprives a company of a leader whom it cannot see fit to retire from office at a given age.

It seems more in keeping with our day and age that enforced retirement should be strictly adhered to as it enhances and permits the gradual training of understudies in the routines, practices and policies of the older executives. This practice creates less confusion and hysteria in a concern than is usually attendant when an important official suddenly dies or voluntarily retires.

J. KOLLARIK, *Industrial Engineer.*

An employee after serving a firm for a number of years should not be forced to retire. In most cases, an employee serving a firm for a long period of time has advanced to a position of some importance and responsibility. This advance has been gradual and due to persistent plugging. Abrupt ending of all responsibility and duties is too much of a shock for the average man.

A better method is to retire the old boys gradually. That is, duties and responsibilities should be decreased after a given period of years or after a man has reached a given age; and this decrease should be tapered off as the man's abilities drop. I do not mean to imply that a shop should be loaded with so-called "old soldiers"—not at all. And the man going down the ladder should be required to perform his duties as efficiently as one going up.

C. F. STAPLES.

Control by Council

"There ought to be a law," is the most readily thought of solution to all forms of adversity. The great depression is evidently a reaction, the factors of which are no doubt possible to control. These are so diversified that a perfect Babel of theories and ideas are rained on us today.

Control of the actions of individuals in industrial and manufacturing problems by a legislative body, with its consequent and constant exposure to politics, self-preserving persons, and reactionary bodies, would be a hindrance, rather than a help.

An economic council, as an adjunct perhaps, to the Department of Commerce, with its facilities for the gathering of facts, and their dissemination to interested persons, would be a help to industry in furnishing data for guidance in manufacturing, and following markets for their goods. Any attempt at setting up a controlling board would not be popular as interfering with the rights of the individual to make or break his business, as he chooses, which is not only practical, but is the idea of liberty, as conceived by Anglo-Saxon peoples.

—JOHN S. ISDALE, *Plant Engineer,*
International Silver Company.

Hand to Mouth

Today everyone is holding back orders. Every department head is afraid to give even a small order for fear he may be called down for recklessness. The result is that there is continual waiting for material. No order is given until the very article or machine is needed, and then immediate delivery is expected.

The company receiving the order wishes to give good service and does its best to rush the work out immediately. Frequently, the result is bad, as excessive haste often means inferior work. It is rushed through to the inspection department, but if they

reject anything, the management by sheer force of circumstances will override them, as the work must be delivered without any delay.

Prosperity cannot return while the present hand to mouth system of ordering continues. The golden rule might well be paraphrased: "Give reasonable orders with reasonable time, just as you expect to receive reasonable orders with reasonable time."

—SIDNEY BEAUJON.

Mourning Becomes Executive

Before considering bonuses for the executives of a company, it should be considered if the company has dealt equitably with its employees and customers. If it has, then the costs and receipts have been so balanced that there will be no surpluses for distribution as bonuses to executives. Executives of any company are only employees engaged in performing special work. As such they should, without thought of special privileges, put into their duties as much effort as they require of their subordinates.

Having authority to make important decisions does not require more effort than is put forth by the person who makes an executive's decisions effective. Bad decisions are frequently made by executives, but we seldom hear of them paying the cost of their own errors. An executive's error is usually much more costly than a subordinate's error. Instead of executives getting bonuses they should be satisfied to spend their best efforts for equitable remuneration.

—L. BROWN,
Montreal, Canada

Most executives feel that they are as much entitled to a reasonable wage incentive as anyone in the organization, and that they should be considered such an integral part of the organization as to share directly in its victories and its defeats. Assuming that the executive has a right to an incentive wage, the question of the amount of bonus becomes predominant; in other words, an arbitrary ratio between salary and bonus must be set up. If the bonus ratio is too large, the executive will draw excessive amounts during a boom period, and will receive a tremendous shock during the low end of the business cycle. This decrease in morale may seriously reduce his basic efficiency and retard the entire corporation in its recovery from the slump.

From the viewpoint of the management, or more exactly from that of the directors, any bonus plan must be based upon a definite standard of accomplishment and rated from a thoroughly practical economic basis. The accomplishments of an executive are absolute in that they are effective to a marked degree upon the general profits of the organization, but they are far from being tangible. This intangibility of executive results, on a profit and loss basis, means that the bonus, if any, must be kept low when compared with his salary, or outside influences are likely to allow it to grow impossibly large.

—J. R. FREYERMUTH,
Production Engineer,
Minneapolis-Honeywell Regulator Co.

No Questions Asked

An engineering firm prospers because of just one reason—it gives the customer what he wants when he wants it. In the case outlined we have a man who wants a machine made. He has the money to pay for it. Then make what he wants. If we think the design is impractical, it is always possible to go on record in a nice way by giving our opinion. That opinion may be wrong. Most of the major inventions had plenty of scoffers and critics before they were a success. If inventors were easily discouraged, few improvements would be made. Engineering ethics certainly do not demand the refusal to build mechanisms of doubtful success.

—J. K. MATTER,
Manufacturing Manager
Aluminum Cooking Utensil Company.

The question of determining whether exceptions to a design should be brought to the attention of a customer seems to rest with the circumstances supporting the inquiry. If there is no competition involved, but merely a question of establishing a price for the guidance of the customer, it appears that any competent manufacturer detecting inaccuracies in design should not hesitate to bring them to the attention of the designer before submitting a proposition. Otherwise how can they hope to justify the confidence placed in them? If a company is called upon to quote against a competitive field, the logical thing to do is to submit a price on the basis of prints accompanying the inquiry. If successful in securing the business, that is the time to bring out any questions concerning design.

—PAUL S. HERCKMAN,
Cost Accountant,
American Die and Tool Company.

Dominant or Dumb?

We do not have any one man shows in our organization. There seems to be a glamour to the picture when the head of the company sits in his holy of holies and snaps out orders that are obeyed without question. But is it the best policy?

We believe in conferences. Not the kind that have been popularized during the past several years, where the heads of the company gather for social entertainment and idle gossip, but the meetings of those who are responsible for the work being carried through into execution.

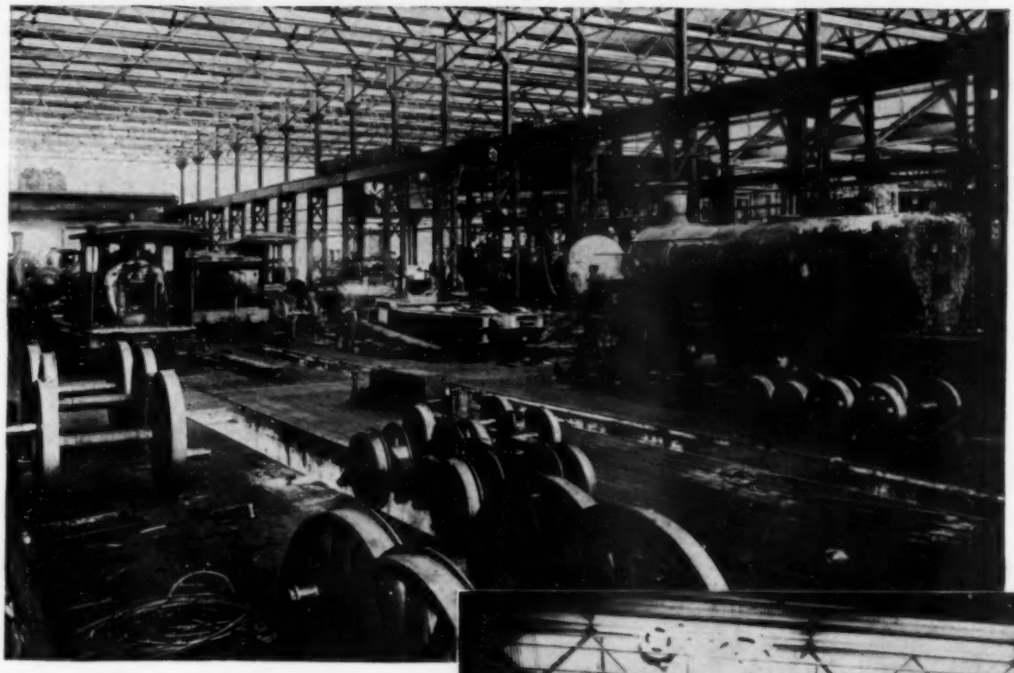
A job coming into the plant is torn to pieces by the various foremen, gathered for the sole purpose of deciding the procedure to be followed in manufacture. Each man is permitted to tell how he would handle the work in his department and what degree of accuracy he would need from the other departments to expedite it.

What do we gain by such tactics? In the first place every job going through the plant is "our job." It means that personal interest is raised to the highest point because the various men have been in at the conception of the job and feel that it is to their personal interest to put the thing over.

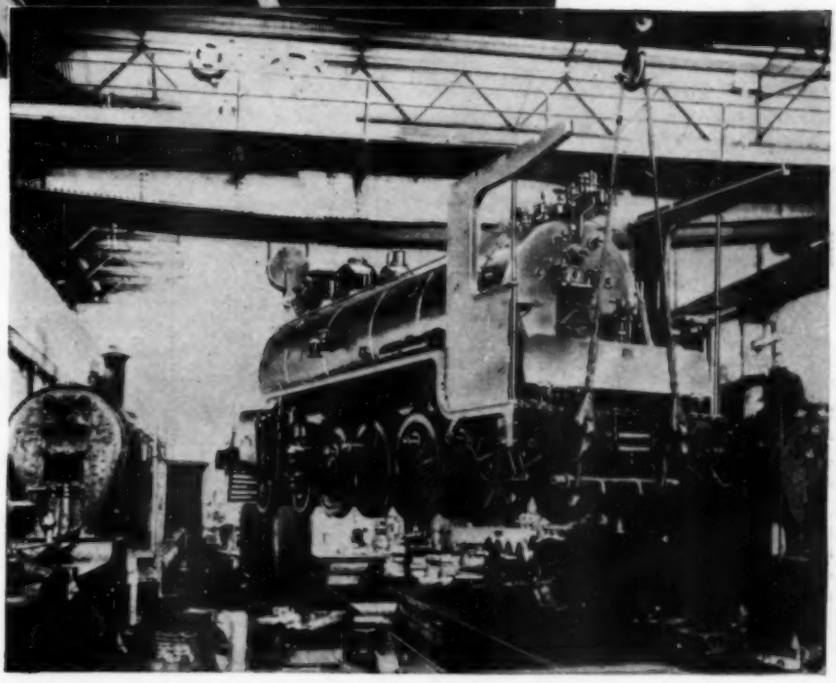
It means that the absence of the person of highest rank does not cripple the procedure, because the same plans are followed as if he were present. In fact, it seems as if the men try twice as hard to put the proposition over so that the higher executive will be pleased at the way the thing was handled.

Allowing a person to express his opinions stimulates his imagination and enables him to grow mentally. We never ridicule a suggestion, no matter how absurd, nor do we permit others to do so. With as much tact as possible, we try to take the suggestion and work it around in such manner that even though the final result is nothing like the original, the man still thinks that his idea helped.

—E. F. WERNER, *Superintendent*
American Fixture & Showcase
Manufacturing Company.



For rolling stock maintenance, the far Antipodes boast of facilities comparing favorably with those in the United States. Orderliness is the keynote of the boiler shop. At the left may be seen a large bending brake. A saw tooth roof provides excellent lighting. In the erecting shop ample room is allowed overhead and around the pits. Below is shown one of Australia's locomotives slung from two traveling cranes



Government Railway Shops in Queensland

Large Savings in Small Tools

Tool inventories have been reduced 63 per cent by a comprehensive system of control

E. E. BLEICHER
Staff Master Mechanic, Chrysler Corporation

IN manufacturing plants of any magnitude, expenditures for tools necessarily assume large proportions. In corporations, with manufacturing units spread over six or seven independently located plants, the effective control of tool expenditures presents a real problem. The term "tool expenditures" relates not only to the purchasing of new tools but also to the control of obsolete tools and the salvaging of tools for the best interests of the corporation.

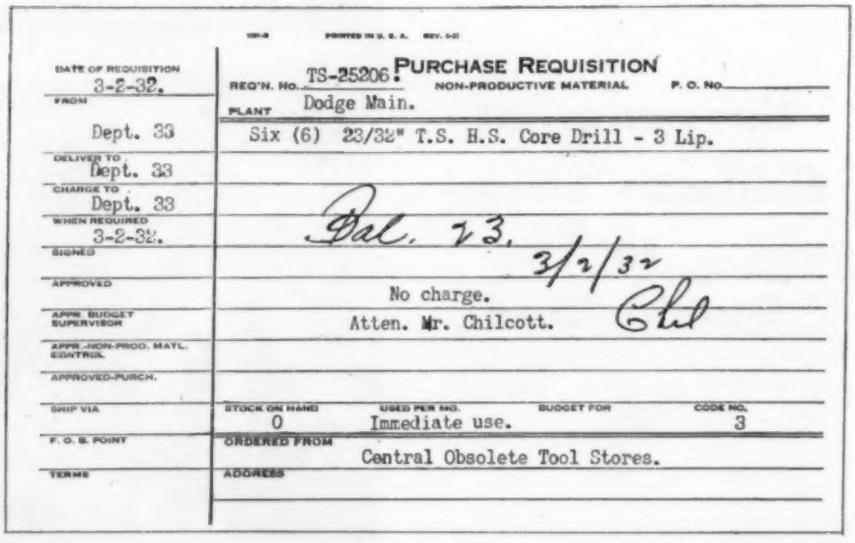
In a majority of cases, a change in the design of the product manufactured necessitates a new set-up which obsoletes old tools. Unless a positive means of liquidating the obsolete material for the benefit of the corporation is established, the value of the obsolete stock may result in a serious, unnecessary tie-up of a large proportion of the company's assets. With the constant improvements and changes made in the products manufactured from year to year, the problem of effective tool control, especially in the automobile industry, assumes a position of vital importance.

Many consultations have been held and many articles written describing ways and means to relieve this vexing situation. Already a great deal has been accomplished by those who realize the possibilities of taking definite steps to turn back into the shop workable tools that otherwise would be sold as scrap. On the other hand, there has also been a tendency to treat the subject of tool control too much in the abstract and to consider it as a necessary evil. This attitude may persist because the management is not conversant with the amount of money that can be tied up in this way. Also it is not generally recognized that there are practical ways of coping with this problem that will mitigate the situation and will show substantial savings by way of reducing inventory and salvaging tools that would otherwise be discarded and sold as scrap. This article describes how a large automobile manufacturer, with several independent manufacturing divisions, endeavors to solve this problem.

It became evident, at the outset, that definite standards, covering the design and dimensions of small tools, were necessary so that each plant would know what was being used in all the other plants and at the same time have a complete description of the tools involved. To accomplish this purpose, a standard catalog was set up covering all requirements for small tools. This cataloge is composed of individual sheets, which show a cut of the tool, together with detailed information as to dimensions, tolerances and material. A part number for ordering purposes is also assigned to each tool. Tools which are not shown in the book of standards are considered special. This standardization results not only in a reduction of stock to be carried but also enables a shifting of tools from a relatively idle plant to a more active plant within the organization.

The next step necessary was to establish an effective control over the purchase and disposition of tools, this control to be sufficiently flexible to cover all plants and to function efficiently with the fluctuating production requirements. For this purpose, a department known as the non-productive material control division has been established. This department is under the supervision of the staff master mechanic and is centrally located for the convenience of all plants.

The duties of this department are to reduce inventories to a minimum by utilizing the excess stock on hand, procurable from any of the plants of the corporation, and to prevent the accumulation of excessive inventories. While the functions of this department cover all non-productive materials, the remarks in this article are confined to the procedure governing small tools such as drills, taps, milling cutters, tool bits, gages, and grinding wheels. The non-productive material control department operates and maintains a central obso-



DATE OF REQUISITION: 3-2-32.
REQ'N. No. TS-25206 PURCHASE REQUISITION NON-PRODUCTIVE MATERIAL P. O. No.
FROM: Dept. 33
PLANT: Dodge Main.
DELIVER TO: Dept. 33
CHARGE TO: Dept. 33
WHEN REQUIRED: 3-2-32.
SIGNED: Dal. 73.
APPROVED: 3/2/32
APPR. BUDGET SUPERVISOR: No charge.
APPR.-NON-PROD. MATL. CONTROL: Atten. Mr. Chilcott. Chil
APPROVED-PURCH.
SHIP VIA
F. O. B. POINT
TERMS
Six (6) 23/32" T.S. H.S. Core Drill - 3 Lip.
STOCK ON HAND: 0 USED PER NO. Immediate use. BUDGET FOR CODE NO. 3
ORDERED FROM: Central Obsolete Tool Stores.
ADDRESS

Purchase requisitions are checked against surplus stock and obsolete stores before release

lete tool stockroom which is a clearing house for obsolete tools. In addition, each plant maintains and operates independently its own stockroom for current tools.

To illustrate the above, the following is the course of a purchase requisition before it is finally approved for purchase: When a new tool is required, a purchase requisition is issued from the office of the tool supervisor of the plant concerned and is forwarded to the non-productive material control department. This department first checks the stock in other plants to ascertain whether the requisition can be filled from surplus stock. If it cannot, the central obsolete stores are next checked to determine if they can furnish the tool or whether any other tools are available, which can be reworked economically to fill the requisition. If requisition cannot be filled from the above sources, it is approved and forwarded to the purchasing department.

In the foregoing discussion, the physical handling of small tools has been stressed. As a further aid to this economic program, a financial check is made at each unit through the medium of a burden control department. All requisitions for tools must pass through this department to be checked against usage allowances. These allowances are based on actual plant conditions and the amount of work to be handled. This usage allowance is used as a buying guide, the principle being not to buy anything that will not be used in the current month.

It might be well to state here that, as an inducement and to encourage the use of salvaged tools, the plants receiving the reworked tools are charged only for the cost of reworking. Tools that cannot be reworked are turned over to the byproducts department to be sold.

On the surface, it would seem that the foregoing procedure would delay the filling of requisitions. Such is not the case, however, as requisitions are cleared through the non-productive material control department within a few hours from the time they are received.

Now the question arises, "What are the benefits from setting up a department such as has been described?" It is gratifying to be able to report that over a period of two years of relatively low production, the above procedure has resulted in a reduction of 63.21 per cent in the total value of tool inventories.

In carrying out such a program, it is appreciated that the cooperation of all concerned is essential. The success or failure of any project is in direct proportion to the degree of cooperation that is obtained. While this discussion has been confined to the method of the control of small tools, it might be added that such a department has infinite possiblities if applied also to supplies, machine tools, jigs and fixtures.

Weights, Rates and Costs by Chart

Discussion

PAUL R. FECHHEIMER
Engineer, Karl Kiefer Machine Company

A BRIEF addendum to D. W. Pinkerton's article under the above title (*AM*—Vol. 76, pages 321 and 370) might be in order. The tables given are based on the following relationship between arithmetic and geometric progressions: If we take two terms in an arithmetic progression, A_z and A_y, and their corresponding geometric terms, G_z and G_y:

$$G_z = r^{A_z} \text{ and } G_y = r^{A_y}$$

Likewise, the product: $G_z \times G_y = r^{(A_z + A_y)}$

Where r is the geometric ratio.

To multiply any terms in the geometric progression it is merely necessary to add corresponding terms in the arithmetic series and then to return to the geometric to the term which corresponds to the arithmetic sum thus obtained.

Now there is a relationship between an arithmetic and a harmonic series which may be of some interest in connection with these tables. A harmonic progression is the reciprocal of an arithmetic. Therefore, if we take two terms in a harmonic progression, H_z and H_y, and the corresponding arithmetic terms, A_z and A_y:

$$H_z = 1/A_z \text{ and } H_y = 1/A_y.$$

If we take the reciprocal of the sum of the two arithmetic terms we have: $1/A_z + A_y)$ which equals $1/(1/H_z + 1/H_y)$ or $H_z \times H_y /(H_z + H_y)$

Therefore, if we desire a product of two harmonic terms divided by the sum of the same terms, we need only take the sum of the corresponding arithmetic terms and return to the harmonic corresponding to this term. Likewise, if we desire a sum of two harmonics divided by the product of the same two, the answer is the sum of the arithmetics. The use of these relations is naturally limited, but in the few cases where they are applicable, they eliminate considerable labor.

For example, to determine the average speed of a planer table the formula is:

$$\text{Average Speed} = \frac{2 \times \text{cut speed} \times \text{return speed}}{\text{cut speed} + \text{return speed}}$$

The answer is obtained by substituting the cut and return speed values in the H table, adding the corresponding A table values, and substituting the sum in another $A - H$ table compensated for the factor 2. The answer, of course, would be read in the H table.

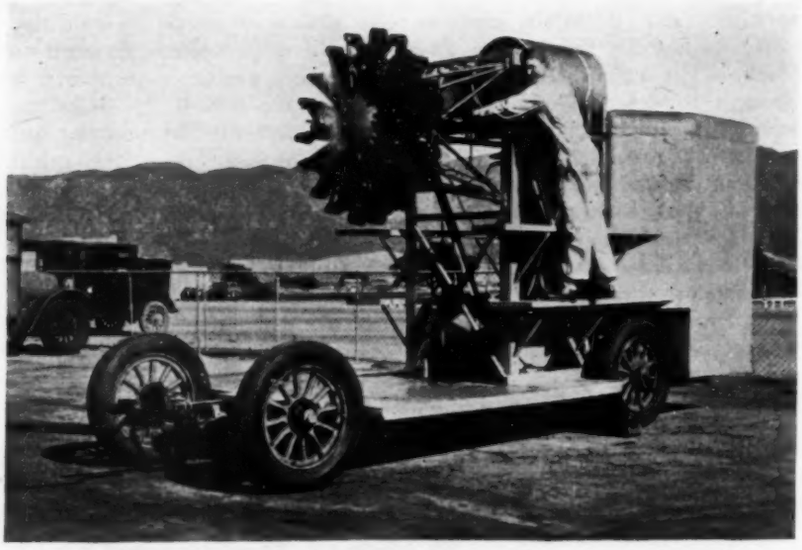
Example:

Suppose we wish to find the average speed corresponding to a 34 ft. per min. cut speed and a 60 ft. per min. return speed. Substituting these values in the cut and return speed chart in the illustration, we find the corresponding A values to be 0.0166 and 0.0294, the sum of which is 0.0460. Opposite 0.0460 in the average speed chart, we read the answer, 43.5 ft. per min.

Cut and Return Speed Chart		Average Speed Chart	
A	*H*	*A*	*H*
0.0166	60.2	0.0332	60.2
0.0182	55.0	0.0364	55.0
0.0198	50.5	0.0396	50.5
0.0214	46.8	0.0428	46.8
0.0230	43.5	0.0460	43.5
0.0246	40.7	0.0492	40.7
0.0262	38.2	0.0524	38.2
0.0278	36.0	0.0556	36.0
0.0294	34.0	0.0588	34.0
0.0310	32.3	0.0620	32.3
0.0326	30.7	0.0652	30.7

When Airplanes Need Service

Inexpensive and adequate service facilities were largely responsible for the rapid expansion of automobile usage. Will airways follow highways in like manner?



Developed by the service shop, this portable engine test stand carries its own inclosed instrument room and testing apparatus

AVIATION leaders have for some time recognized the advantages of making the extensive shop facilities of airline service depots, or some equivalent service, available to the casual flyer. It is realized that until the country is uniformly served by a number of large stations, capable of taking care of all needs of the transient flyer from the sale of a dozen cotter pins to the complete overhaul of plane and engine, regardless of the type of equipment, the volume of miscellaneous flying will be relatively slight. Somewhere from six to a dozen complete service stations of this sort are absolutely essential to the conduct of general flying the year round, but until recently there has not been even one such organization capable of giving adequate service.

Furthermore, it is essential to the economical operation of the small service operator that he be able to send his heavy mechanical work out to some nearby service station qualified to give the equivalent of factory service and to do it quickly and reasonably. It is also of great importance that air transport lines combine wherever possible to send certain of their jobs out to such a centralized depot. Especially in the case of small operators with relatively small shops and few pieces of flying equipment is it uneconomical to set up a complete shop for the purpose of overhauling the few engines in service. The prospect of low operations costs and profits from operations are bound up with problems of reducing costs of maintenance of the airlines, and by such cooperation, this low cost of maintenance can be effectively achieved.

Such a centralized service base has been successfully built up at Los Angeles, Calif., by the Pacific Airmotive Corporation, Ltd. This organization is the largest independent aviation service and supply base in the world. It is licensed by the Department of Commerce to repair every type of equipment for which licenses are issued, including all types of aircraft, engines and propellers. Pacific Airmotive carries a complete stock of genuine factory parts and has complete shop facilities and factory trained personnel to service engines and other parts in strict accordance with factory specifications.

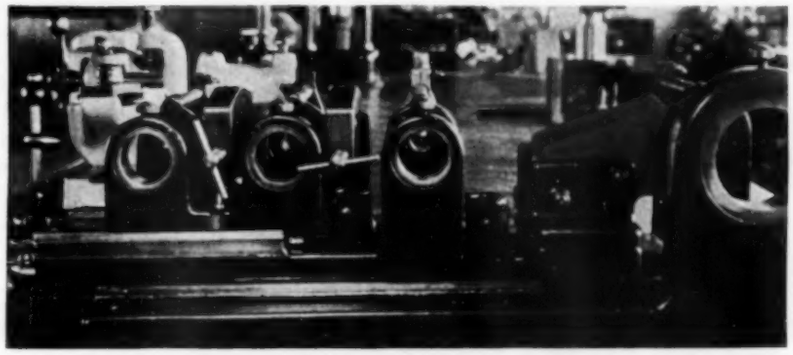
The territory served by Pacific Airmotive includes roughly the eight western states of California, Arizona, Nevada, Utah, Montana, Idaho, Washington and Oregon. In addition to the main service and repair base located at United Airport, Burbank, there are two branch stations, one at Los Angeles airport and another at Oakland airport. Hangar storage, and general service and supplies are available at all three of these branches, although the bulk of heavy engine overhaul work is performed at the United Airport base. In addition to these three establishments, there are four approved service and supply bases operating as dealers handling parts and supplies distributed by the Pacific Airmotive Corporation: San Diego Air Service, Santa Maria Airlines, Northwest Air Service (Seattle), and National Parks Airways (Butte). A stock of parts is maintained at all of these points, and general service is available. Total business done by this organization in 1931 approximated $250,000.

The Pacific Airmotive base at United Airport is so complete that almost any type of aircraft can be constructed from the ground up, including aircraft engineering work, except for rough castings and forgings. The total mechanical equipment is valued at approximately $60,000, with an additional $15,000 invested in company delivery cars, aircraft and miscellaneous. The investment in parts stock totals about $90,000, and in-

cludes more than 6,000 different items.

This firm started business late in 1927 with a staff of but six people and a building with only about 5,000 sq.ft. of floor space in West Los Angeles. The first step toward expansion was taken in 1929 when the company was reorganized under California laws and under the present name. In August, 1930, the operating base was moved to Los Angeles airport, and a new hangar and shop headquarters were erected with a total floor space of about 27,000 sq.ft. During 1930, the Oakland airport branch was established and three subsidiary service stations were authorized. During 1931, the company equipped for Kinner engine service, and in October of that year, it was appointed factory sales and service representative for the Pratt & Whitney and Warner engines, and for Hamilton-Standard steel propellers. At that time, the headquarters was moved to the present location at United Airport, Burbank, where a large hangar and shop building with 36,000 sq.ft. of floor area was taken over. There are now special departments devoted to aircraft, engines, instruments, propellers, magnetos, starters, generators, and general engineering. This is in addition to the stockroom and retail store where parts of all sorts may be purchased. Total personnel at Los Angeles is now 46 persons, including 19 men in the engine shop, 9 in the aircraft repair department, 3 in the propeller repair department.

Inspectors and mechanics in the engine repair shop are highly skilled and receive intensive training in all phases of airplane repair from factory representatives



A universal rod-boring machine forms one unit of the many pieces of special equipment capable of building a plane from the ground up

In connection with the development of the complete service station, there has been the fullest cooperation from all of the factories represented. Equipment has been installed that was the best obtainable and that fully conformed to factory requirements. Factory trained men have been employed permanently or have been obtained temporarily to give special training to men who were already the finest workmen to be had in their line.

Equipment now installed includes a complete outside cleaning plant for engine parts, a sandblasting machine, an automatic baking oven for enamelled parts, an automatic oil bath tank for tempering metal parts, a 60-ton hydraulic press for straightening propellers; also propeller etching tanks and complete grinding and polishing equipment. The engine shop includes the best machinery and special factory equipment available, as well as certain special machinery that has been developed within the shop for problems new to the field. One of these is the special boring fixture that has been developed for boring the center main and rear main bearings of all Wright Whirlwind engines, including those of new series. This fixture has proved so successful that the Wright Aeronautical Corporation has adopted it as a standard tool and has listed it in its special tool catalog. Other special equipment includes a crankshaft vise developed in the local shop and adaptable to all Pratt & Whitney and Wright Whirlwind engines; a Rockwell hardness testing machine, a Wadell Universal Connecting Rod Boring Fixture, capable of boring master and articulating rods for all radial and V-type engines and working to accuracies of 0.0001 in. and a special knuckle pin press for rod assembly work on Pratt & Whitney engines.

Not only does this concern do miscellaneous work for various private and company owned planes and for certain fixed base operators, but it also does certain major engine overhaul work and performs various operations on wheels, brakes and propellers for transport operators.

•

Airplanes, orphan and otherwise, have reached the stage where junk dealers class them with automobiles, which may be a sign that they have arrived as a standard method of transportation. Phoenix, Arizona, in common with many far western cities, has long had extensive junk yards given over to replacing broken or worn parts of almost any make of automobile. Now one of them has added the airplane to its list. The yard occupies a large area not far from the center of the city.

IDEAS FROM PRACTICAL MEN

Kinks in an Oil Tool Shop

HERBERT F. CRAWFORD

Air-operated tailstocks are quite common in oil well tool shops on the Pacific Coast. The one in Fig. 1 is from the Torrance, Calif., shop of the National Supply Co., where it has been applied to a lathe used in turning oil tool joints. The air cylinder gives rapid movement and easy control for the tailstock spindle.

The shop has oblong chip pits at various intervals, Fig. 2, protected by welded guard rails with raised edges on three sides. The pits hold two square chip boxes, which have handling crossbars at two opposite corners, as at *A*. Thus the overhead crane can handle chip disposal easily.

"Stretching" machines to handle work larger than was intended by their designers is usually neither advisable nor satisfactory. But there are cases where the work is light enough to be easily handled by the parts of the original machine. In Fig. 3 a vertical boring mill of uncertain age has been materially enlarged by adding large distance pieces at each end of the crossrail and to the sides of the bedplate. The result is a good-looking boring mill of large capacity on work that is not too heavy. Independent motors have been provided for raising and lowering the crossrail and for moving the tool heads. Power from the latter motors is transmitted to speed reducers by inclosed chains.

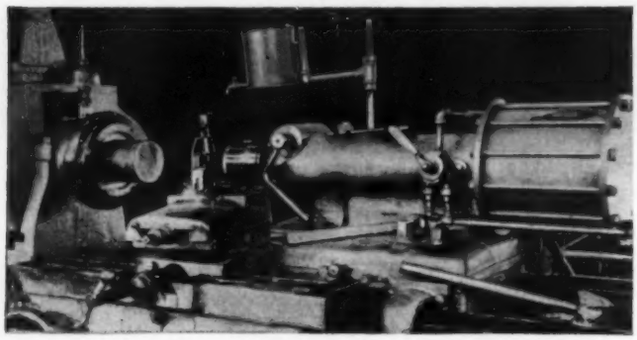


Fig. 1—Air-operated tailstock applied to a lathe turning oil-tool joints.

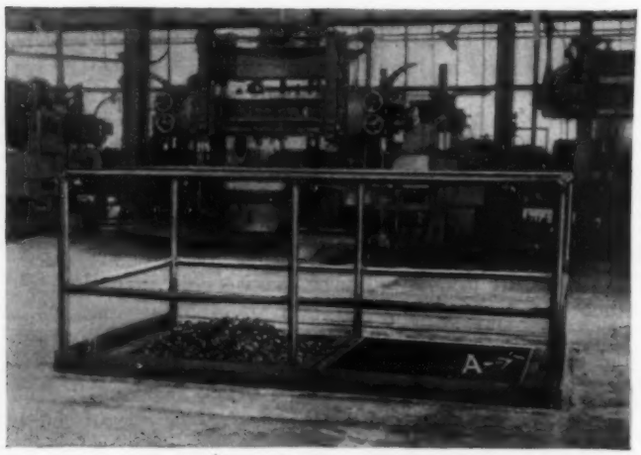


Fig. 2—Oblong chip pits, placed at intervals, are protected by guard rails.

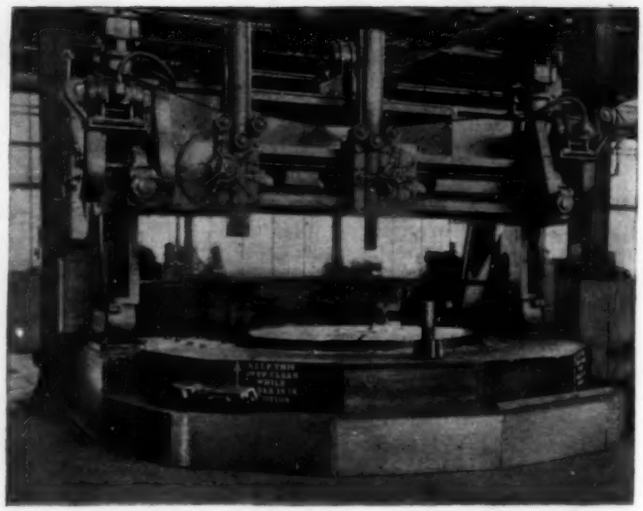
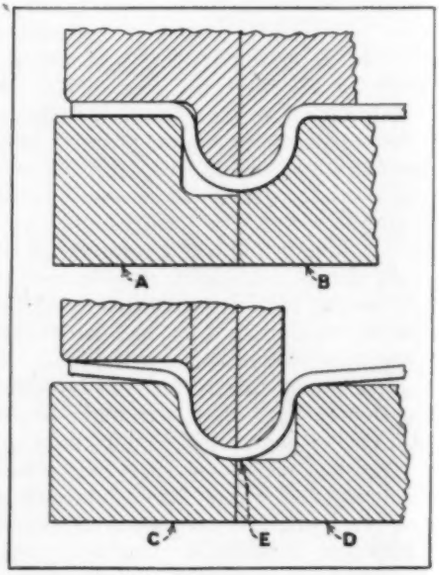


Fig. 3—Long distance pieces on the cross-rail and the bedplate increase the capacity.

Inexpensive Forming Tools—*Discussion*

FRANCIS W. SHAW
Tool and Gear Consultant, Heywood, England

Having read the article by Charles Kugler under the title given above (*AM*—Vol. 75, page 427) and followed the discussions by Henry W. Boehly and Philip F. Shafran (page 860), I am led to suggest that there are many ways in which expense can be saved without introducing weaknesses such as often accompany tools built up of several pieces. A punch and a die constructed as at *A* are cheaper and better than if they were constructed as at *B*, because they allow for larger variations in the thickness of stock and do not entail such accurate work.

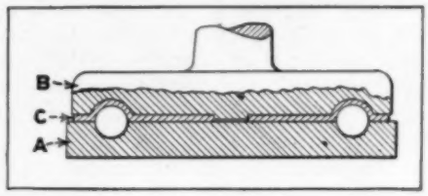


To allow for variations in stock thickness by forming the tools at either *C* or *D* is open to the objection that the work can cock as indicated. If the tools are formed as at *D*, the punch can crush the work at *E* and flatten it.

D. Q. DUNSTONE
Hetton-le-Hole, England

I read with interest the article by Charles Kugler and the discussions thereon by Henry W. Boehly and Philip F. Shafran, page 860. I was surprised, however, to find that a forming tool I have used extensively, and which I assumed was a common type, had not merited mention.

The forming tool that I mentioned above is shown in the accompanying illustration. The circular plate *A* is grooved to fit steel balls of suitable size. The plate *B* is also grooved, but the radius is equal to that of the balls used, plus the thickness of the material *C*. A hole in the center of the work is of value for centering.



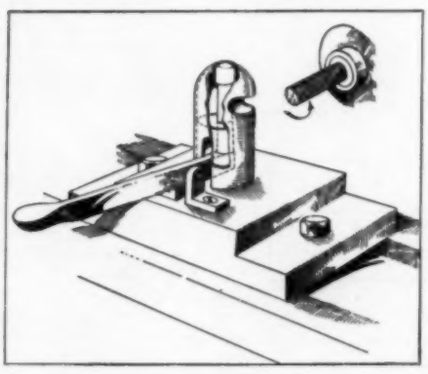
The plate *B* has a shank to fit the spindle of a heavy drill press. With the groove in plate *A* filled with balls, and the blank in place, the forming can be done by rotating the plate *B* and with it the work. Comparatively little pressure is required because the pressure is exerted in a small area at any one particular moment.

A Press Operation Performed by Milling

CHARLES H. WILLEY
Superintendent of Manufacturing, Hoyt Electrical Instrument Works

Most everyone is familiar with the little dome-shaped hoods on the dash lights of automobiles. We needed just such hoods over the lamps of our portable battery-testing instruments, but were puzzled as to the most economical way to quickly tool up for cutting the slots for the light to shine through.

Since the quantity wanted was not large enough to warrant making press tools for the job, we had the luck to hit upon the simple stunt of milling the slots. The hoods are slipped over an upright post in a special fixture that has a lever-operated ejector in the center, as shown in the illustration. With an end mill revolving in a direction that would force the work downward, the hoods were fed against it and the slots were cut. The table of the machine was operated by a lever, and a stop controlled the depth of cut. The device was fast in operation and did excellent work, leaving but a slight burr which was quickly removed by the necessary buffing operation.



The operator milled the slots in 250 hoods in an hour, the time comparing favorably with what was estimated as a three-operation job for a press. Besides, there was a big saving in tool cost.

• NEXT WEEK •

Avoidance of industrial waste was never so imperative as it is today. Unproductive drains on manufacturing resources must be uncovered, analyzed and eradicated. How a sound cost system will achieve these ends is described by Albert E. Grover, Cost Consultant.

Unconventional methods are often used on making instruments parts which require extreme accuracy. "Precision in Pyrometer Parts" describes some novel shop practices employed by the Brown Instrument Company.

Industrial buying habits have changed drastically since 1929, and it is important that buyer and supplier alike recognize this transition. "Industry Goes to Market" tells of the new conditions under which materials are bought and the part played by the production man.

"Effect of Pressure Angle on Gear Inspection," by Sam Trimbath, and "Oil Well Equipment Conforms to the Torch," by Henry C. Francis, will also appear.

• IN A. M. •

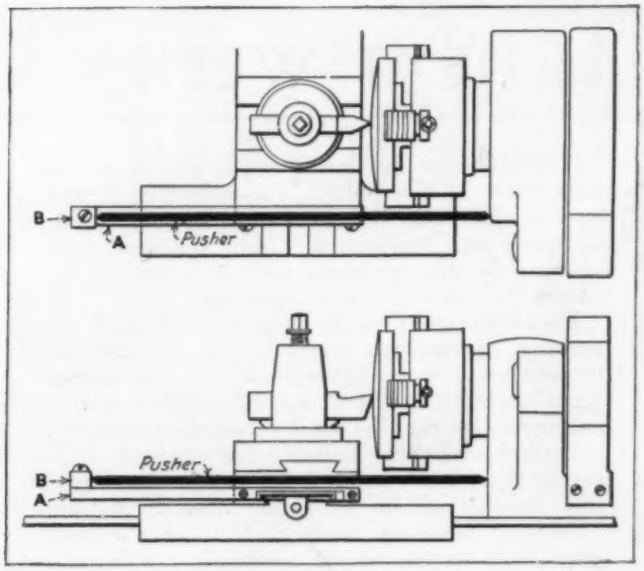
Facing a Concave Surface—*Discussion*

WM. S. ROWELL

Thanks are due H. J. Dillemuth (*AM*—Vol. 76, page 25) for placing before your readers so clear a picture and description of the method of machining concave and convex surfaces. But to the writer it would seem better to make a little more clear the truth that when the pusher is parallel with the center line of the lathe, the cutting tool should be at the axis of rotation. Also that there is no compelling reason for locating the pusher directly under the center line of the lathe. In fact, it will be more accessible and more easily aligned if it is placed beyond the center of the lathe bed.

If the compound rest is left in the normal position, it provides a ready means of bringing the cutting point of the tool to the center of rotation while the pusher is parallel with it. Additional depth of cut can be obtained by tapping the tool farther out of the toolpost. The set-up for convex facing is often more difficult than for concave facing because of chuck interference with the pusher, or because of lack of space between the toolblock and the headstock to introduce the required length of pusher.

I once had a stiff offset pusher forged to overcome



these difficulties. It was offset vertically to avoid interference with the chuck. Such a pusher needs to be overlength as much as its diagonal position necessitates. For example, if the required radius of curvature is 10 in., and one leg of the pusher is 3 in. lower than the other, its length must be the diagonal of a 3x10-in. rectangle, or 10.4403 inches.

The accompanying sketch clearly shows a better way to overcome the difficulties of convex facing. The angle iron *A* with the block *B* is attached to the toolblock by the two screws that held the chip guard. With the angle iron and the pusher each fairly stiff, convex facing may be done as accurately as concave facing.

A Milling Fixture Applied to a Bench Saw

EMIL WITTMANN

Machinist, General Electric Company, Philadelphia Plant

A quantity of brass rods (120,000 pieces) threaded all over, like the one shown at *A* in the illustration, had to be splined. As the quantity was not sufficient to warrant the making of an expensive fixture, the job was given to the shop to find a way to do the work. After careful consideration, it was determined that the work could be done most economically in a circular saw of the type used for cutting non-ferrous metals. The fixture shown in the illustration was made and applied to a bench saw and is simple and convenient in operation. It did the work accurately and economically.

Referring to the illustration, the part *B* is a piece of steel machined as shown and clamped to the saw table by two plain clamps. It serves to guide the rods in correct position over the revolving saw. On the end where the rods are fed in there is a latch *C* pivoted at *D*, and operated by a light coil spring. On the other end there is a tongue *E* that engages the part of the spline just cut and prevents the rods from turning as they are fed through the fixture. Since all bench saws are provided with a means for raising and lowering the table, it is an easy matter to make adjustment for the depth of cut. All the operator has to do is to place the rods in position and to slide the usual T-slide back and forth.

The extension *H* is a piece of flat stock clamped to the T-slide, which stops the feeding movement of the T-slide when the extension strikes the forward end of the fixture. The reverse movement of the T-slide is limited by the stop *J* clamped on the table. At the time the forward or feeding movement of the T-slide is finished and the operator starts to move it in the reverse direction, the revolving saw would throw out the rod, which is now half splined, if the latch *C* were not provided. When the rods are fed into the fixture, they merely slide past the latch, but when the T-slide is drawn back, the latch comes into action and the work is friction locked and is prevented from being thrown out by the saw.

Meanwhile, the operator picks up, with his left hand, another rod out of the container where the rods are mixed with a lubricant and locates it in the guide *K*. Pushing the rod forward, as it enters the fixture it pushes the preceding rod over the saw and out of the fixture. The fixture was made and set up in six hours and the rods were splined at the rate of 2,000 per hour. Cut 4 1-2 in.

Checking External Bevels

JOHN F. THORTON

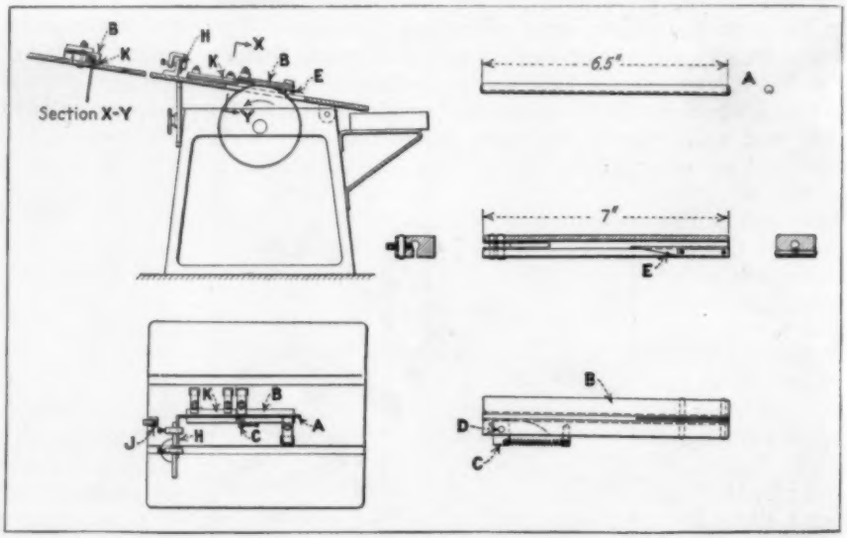
The following formulas give an accurate check for ground bevels on gages or other tool work. They have the advantage over the standard plug method in that the work need not be removed from the grinding machine to check the dimensions.

As shown in Fig. 1 where the work is rectangular:

Side $B = A \sec \beta = 1.1547$ and
side $C = A \tan \beta = 0.57735$ in.

Then

$$(z + y) - (x + y) = B - A = z - x = 0.1547$$



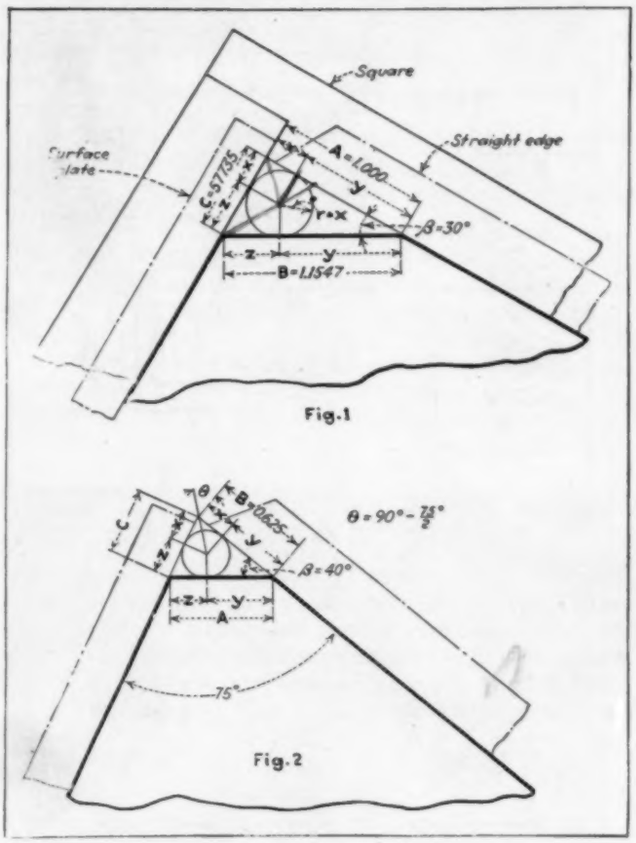


Fig. 1

Fig. 2

Also

$$(z - x) + (z + x) = 2z = 0.1547 + 0.57735 = 0.73205 \text{ in.}$$

Therefore:

$$(z + x) - z = x = 0.57735 - 0.36602 = 0.21133 \text{ in.}$$

Then the diameter of the plug $= 2x = 0.42266$, which is tangent to three sides of the triangle.

By placing a square, or a small surface plate and a straight edge, on the work as shown in Fig. 1, the soft plug may be passed beneath it, checking all dimensions simultaneously provided a sine bar set-up has been used.

Should the work have oblique sides, as shown in Fig. 2, solve x as in previous calculation. Then the diameter of the plug equals:

$$2\left(\frac{x}{\tan\theta}\right)$$

For example:

$$B = 0.625 = x + y$$
$$A = 0.66611 = z + y$$
$$C = 0.44327 = x + z$$

Then

$$(z + y) - (x + y) = z - x = 0.66611 - 0.625 = 0.04111 \text{ in.}$$
$$(z - x) + (z + x) = 2z = 0.04111 + 0.44327 = 0.048438 \text{ in.}$$

Therefore:

$$z = 0.24219 \text{ in.}$$

Then

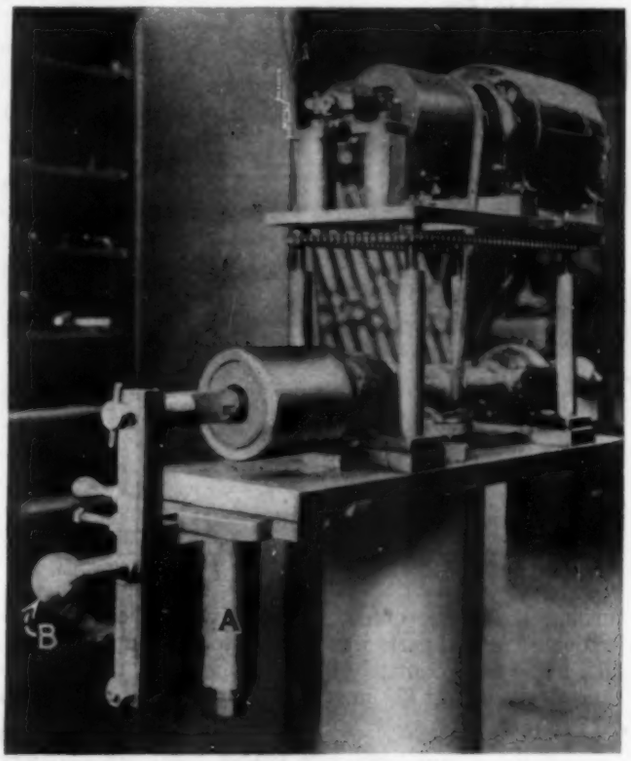
$$(x + z) - z = x = 0.20108 \text{ in.}$$

The diameter of the plug $= 2x \dfrac{0.20108}{1.3032} = 0.30859$ in.

Ring Wheel Grinder for Cutter Radius

HERBERT F. CRAWFORD

Many special grinding machines have been designed and built for toolroom work. This one is from the shop of Emsco Derrick & Equipment Company, Los Angeles, Calif., and is used for grinding toolbits to the proper radius and with the desired clearance. Table and grinding mechanism are mounted at the top of a round column. The grinding spindle has end movement in its



bearings and is belt driven from the drum on the end of the motor shaft. Tension of the belt is regulated by adjusting the four screws at the corners of the motor support. These are moved uniformly by chain and sprockets.

A ring grinding wheel is shown mounted on the end of the spindle, which is moved endwise by a handle in front. This movement carries the wheel over the cutter and, with the cutter rightly positioned, gives it clearance behind the cutting edge. When a radius is desired, the cutter can be swung on the center A by the handle B, the radius depending on the relative location of the cutter and the center of A. The machine has been found convenient for boring cutters and similar cutting tools.

Accurate Spacing in the Lathe

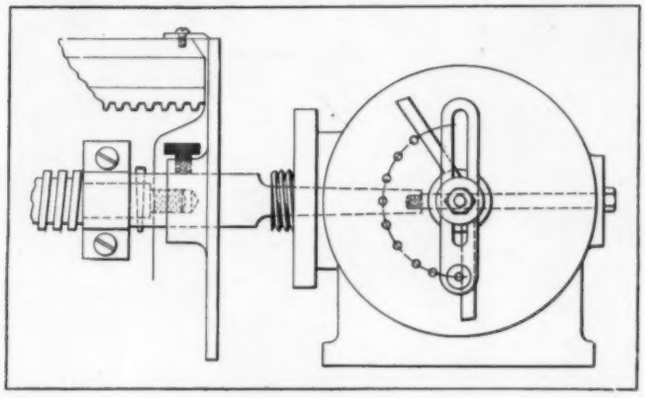
R. HENDERSON, 3D.
Superintendent Machine Shop,
Kutztown Foundry & Machine Company

The method here described may be of interest to anyone who has graduating or spacing to do. We had to cut several hundred annular grooves in steel bars, the distance from center to center being 0.1645 in. within close limits.

The spacing was done by a dividing head taken from

a universal milling machine and mounted at the end of the lathe in line with the lead screw. The two were then connected by a coupling as shown in the illustration. As the pitch of the lead screw was $\frac{1}{4}$ in. and the spacing was to be 0.1645 in., it was necessary to rotate the lead screw $\frac{0.1645}{0.2500}$ of a turn. The reduction of the dividing head being 40 to 1, the index crank had to be turned $\frac{0.1645}{0.2500} \times 40$, or 26.32 turns, or 26 turns and eight holes in an index plate having a 25-hole circle.

Fearing that the operator might make a miscount in



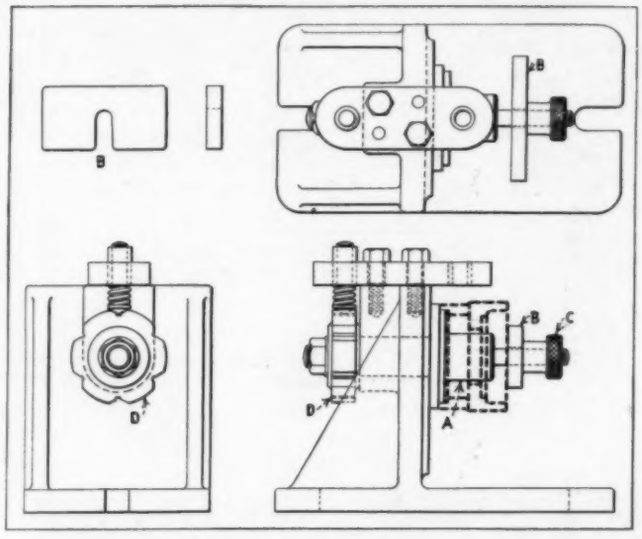
turning the index crank, a disk having the periphery graduated in 500 parts was secured to the coupling. The disk being approximately $9\frac{3}{4}$ in. in diameter, the graduations were almost $\frac{1}{16}$ in. apart. By cutting notches in two of the graduations 329 spaces apart we had $\frac{329}{500}$ of 0.2500 in., or 0.1645 in., thus providing a check on the indexing. The disk was reset before each indexing. The finished job was just as accurate as the lead screw.

Jig for Drilling Discharge-Valve Cages

CHARLES C. TOMNEY
Chief Tool Designer, Brunswick-Kroeschell Company

A jig for drilling the ports in the cages of discharge valves is shown in the illustration. After the lathe work has been completed on the cage, it is placed over the stud *A*, the large diameter of which fits the counterbore of the cage, as indicated by the heavy dotted lines. The slotted clamp *B* is then put in place and the knurled nut *C* is tightened, holding the cage securely.

While there is nothing unusual in the holding part of the jig, the indexing device is rather out of the ordinary. The notches in the index plate *D* are at an included angle of 120 deg., the engaging part of the index pin *E* being at the same angle. In indexing, but one hand is required, a slight turning pressure being sufficient to force the spring-actuated index pin out of the notch in which it is engaged and to turn the work and the index plate. When the next notch in the index plate coves opposite to the in-



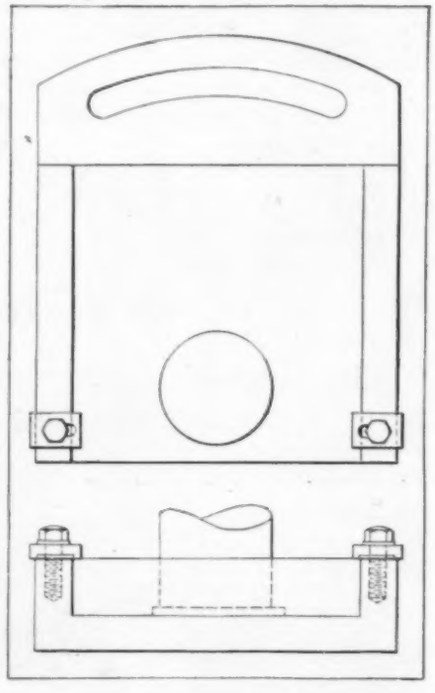
dex pin, the pin snaps into it, bringing the work into position for drilling the next hole. Since the holes are merely discharge ports, their spacing does not have to be accurate within close limits, consequently the notches in the index plate did not have to be ground after the plate was hardened, but merely polished with abrasive cloth.

Cutting Slots in Shapers—*Discussion*

FRANK A. GABRIEL

Referring to the article by Robert S. Alexander under the title given above (*AM*—Vol. 76, page 406), my experience with setscrews for holding the clapper, as advocated by him, has been that the screws will work out, either from vibration of the machine or because they were not properly tightened in the first place. The result is that when the screw point has worked almost clear of the clapper, it has so little hold that the pressure of the tool on the return stroke will lift the clapper and score it against the screw point.

In one shop where I worked, the clappers on the shapers were so badly scored by the setscrews that I devised the method of clamping them indicated in the sketch. The elongated holes in the clamps permit them to be slid out of engagement with the clapper when the shaper is used for its regular work.



Heavy-Duty Combination Dies Constructed From Triangular Steel

HARRY G. SCHOLTZ
Chief Engineer, Heavy Stamping Division, The Murray Corporation of America

Large, heavy, combination blanking and piercing dies made from triangular steel, as shown in the illustrations, are being successfully used in the manufacture of frames and side rails for automobiles, the stock varying from $\frac{1}{8}$ to $\frac{7}{32}$ in. in thickness.

A section of such a die is shown in Fig. 1, the punch being in place. It will be noted that the triangular steel *A* is clamped against the sides of the punch pad *B*. The punch pad is of the same outline as the punch, the only

difference is that the pad is slightly larger than the punch *C* to provide the proper die clearance. The clamps *D* for holding the triangular steel in place are cast steel and have 3-point bearings. The point *E* bears against the triangular steel, while the points *H* and *J* act as a heel. The 1-in. round lug *K* engages in a hole in the die-shoe to hold the clamp in position.

The triangular steel is bought in 12-ft. lengths. Cuts are taken on the faces *L* and *M* and the bars are cut into sections of standard lengths. The ends are then squared and the sections are ready for hardening. After hardening, faces *L* and *M* are ground and the sections are ready for assembly. Of course, this refers to the straight sections only, as the curved or irregular sections must be fitted.

Dies of this type have four distinct advantages over those of the screw and dowel type: They are comparatively inexpensive to build, it is a simple matter to repair sheared sections, it is easy to make new sections, and the triangular steel offers two surfaces for grinding instead of the usual one surface, which makes it possible to keep the cutting edges in first class condition, regardless of the age of the die.

If one of the sections should become sheared, it is a very simple matter to repair it. If the face *L* is deeply scored, the marks can be ground out and the section can be put back into place. No fitting is necessary on the straight sections, the punch pad taking care of the proper die clearance. A curved or an irregular section is repaired in the same way, with the exception that it must be fitted to the punch pad after grinding. However, if care is exercised in grinding, little fitting will be necessary.

If the cutting edge of a straight section is merely rounded, and the face *L* is in otherwise good condition, the grinding is done on face *N*. Unlike dies of the screw and dowel type, upon which it sometimes takes days to make repairs, it is a matter of hours only to repair sheared sections in a die of the type described. Spare straight sections can be kept in stock and it is a matter of minutes only to take out a damaged section and replace it with a spare. A die of the construction described can be seen in the upper part of Fig. 2, the punch being below.

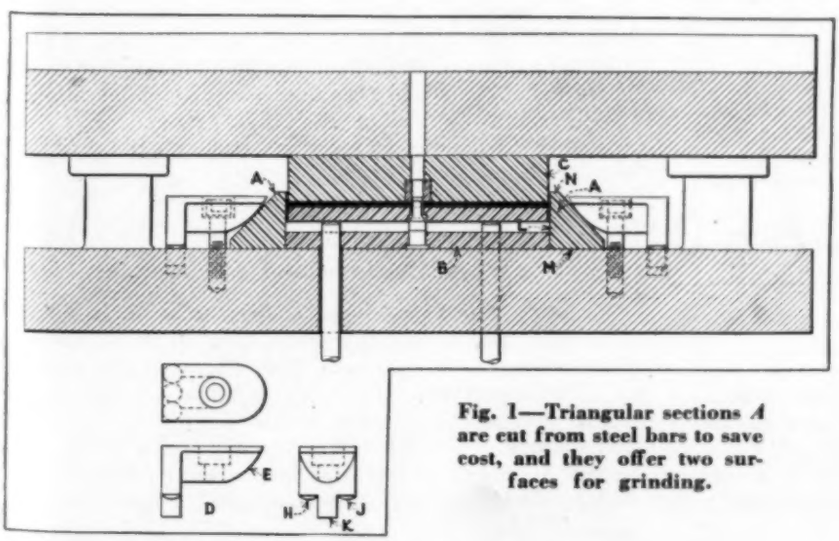


Fig. 1—Triangular sections *A* are cut from steel bars to save cost, and they offer two surfaces for grinding.

Oversize Work in a Small Planer

Discussion

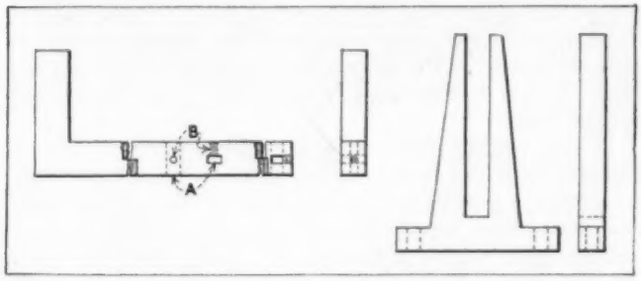
F. M. A'HEARN

The comments by J. T. Towlson (*AM*—Vol. 76, page 59), on the tool described by T. Sakamoto in an article under the title given above (*AM*—Vol. 75, page 29), creates the impression that neither Mr. Towlson nor Mr. Sakamoto has considered an extension tool having a bent shank, such as the one illustrated herewith. Of the two tools described by the authors referred to, that of Mr. Sakamoto's is preferable, having the advantage of being quickly and cheaply made. Although it is possibly not so rigid as the tool described by Mr. Towlson, no doubt it would be chosen by the average shopman as being satisfactory for the work in hand.

Examination of Mr. Towlson's device prompts several doubts as to its value. For example, as the pilot is described as being 5.590 in. for a 6-in. bore, the inference is that a similar or proportionate clearance is allowed for bores of various diameters. This suggests either a single-purpose tool, if the keyseating job is a rare one, or else an accumulation of unadaptable tools if bores of different diameters are occasionally keyseated. The cost of a pilot for each size of

bore is another consideration. In connection with the action of the tool, is there not a chance of wear in the upper side of the bore where the upward thrust of the tool must be resisted?

The most serious objection, however, is the accident hazard connected with its use. If, as Mr. Towlson states, the pilot only partially leaves the bore on the return stroke of the planer, and the length of the pilot is (as shown by his illustration) 4½ in., then the maximum distance from the end of the hub to the setscrew would be 2 in. In feeding the tool, the time allowed for the operator to insert the wrench, adjust the screw, and remove the wrench would equal the time for the table to travel 4 in., plus the reversal period. On a



belt-driven 36x36-in. planer having an 8-ft. table, built more than 25 years ago, the time for feeding the tool would be, as nearly as it can be determined, less than two seconds. With a modern planer, the time would be decidedly less. Failure to remove the wrench from the hollow setscrew, before the screw passed within the hub, would mean possible injury to the operator, the work, or both. The method would probably be forbidden in shops seeking to eliminate accident hazards.

The tool illustrated herewith is sometimes used in American shops for keyseating or for similar jobs. Usually, a horizontal and a vertical slot cross each other near the right-hand end. A single setscrew in the center will hold a cutter in either position. So far, the tool is merely another form of the one shown by Mr. Sakamoto. On larger jobs, however, the cutter slots *A* and the setscrews *B* are placed midway of the length of the extension, while the outboard end of the extension is supported by the slotted bearing illustrated, which is secured to the planer table. The tool is held in the clapper block by the vertical end and is operated by the vertical feed, the outer end being free to move vertically in the outboard bearing.

SEEN AND HEARD

JOHN R. GODFREY

Another Racket

Here's a racket in the metal-working industry that for sheer daring beats some of the widely heralded rackets in milk and beer and other popular commodities. We know of two firms that were "stung," but an executive in a third used his head and did some quick work with a credit bureau.

Mr. John Smith, temporarily out of a job, set himself up with a month's rent paid in two separate offices in Cleveland. One he called the *A* Stamping Company, and the other he designated as the *B* Specialty Company. At *A* office, he was John Smith; at *B* office he was John Brown. Equipped with a raft of blueprints from one set of drawings, John Smith wrote to a long list of tool and die contractors and jobbing shops and said he had good connections where he could secure jobs if he were allowed a 5 per cent commission.

John got many favorable replies from shops needing work these days, so out went the blueprints from office *B*, and John Brown, purchasing agent, accepted all quotations, even though three from the same town on the same tools varied widely. Promptly upon acceptance of the job came a bill from the original John for his 5 per cent commission.

The "racket" was good just once, but the number of victims could be large. The two offices are vacant now, and the Cleveland police are looking for John. But the lesson to chalk up seems to be that it might save expense if credit information is requested before any money is spent bidding on jobs.

Bean Oil in the Foundry

Changes in methods are not confined to the machine shop. I recently ran across a foundry where linseed oil, the old-time binder for core sand, has given way to a new oil. It is the oil from the soy bean of China or Korea and it has made a place for itself in this foundry at least. They are also finding that the new lacquers and finishes are releasing some of the imported oils that were formerly expensive and bringing them down to a price that can be used for other purposes. The soy oil makes a strong core, even when used in small proportions, and yet the core comes out easily after the casting is made.

Cork in Place of Rubber?

"Bulging" punches and dies have long had their place in sheet metal work in the manufacture of salt cellar tops and the like. Oil or water has in most cases given place to rubber as the expanding medium. In some instances, however, a composition in which cork is a prominent ingredient has proved advantageous. Cork has the qualities of compressibility and resilience in good measure, both of which are valuable in many applications. If you are having trouble with bulging dies it might pay to see what cork can do for you. It stands compression without appreciable "set."

Wheel Hardness and Vibration

Grinding wheel grade has a direct relation to vibration. This was strikingly demonstrated in an automobile plant recently. A change in layout brought the piston-grinding department from the second to the first floor where the machines were mounted on firm concrete foundations. Vibration was greatly reduced by the move. It was discovered that in the new location harder wheels could be used with consequent longer life and better finish.

American Machinist

Reference Book Sheet

RELATIVE WEAR OF METALS FROM ABRASION

IN THE hope of ascertaining, particularly for power transmission chain purposes, the type of material best suited and the type of treatment which should be applied in order to obtain maximum wear value at a minimum of cost expenditure, Link Belt Co. began in 1923 an investigation of the effects of abrasive wear.

Consideration was first given to the manner in which surfaces would abrade. Where two cooperating metal surfaces are separated by a film of lubricant sufficiently adequate to withstand the bearing pressure, no wear occurs. In the presence of foreign material sufficiently spread and of a dimension less than the thickness of the oil film, the foreign material will not abrade. In the presence of abrasive material thicker than the oil film, metal surfaces abrade.

A uniform rate of attack on the materials tested was obtained by experiment. A rotating machined cast-iron doughnut-shaped disk, supplied with a fixed amount of a uniform abrasive in the presence of fixed amounts of water, furnishes a uniform lap. Water was selected because of the thinness of its film and its ability to keep temperature uniform. The doughnut-shaped disk was rotated at a speed which would not build up centrifugal action to a point at which the abrasive would leave the lapping disk before contacting the test specimens.

Selection was made of a uniformly sized abrasive (80 mesh Crystolon) which would keep turning over on itself and which would not merely scratch the surfaces being abraded. This action gave to the parts a frosted appearance, indicating that the abrading action was not that of a uniform scratch but was more of a turbulent action.

It was decided that the loss in weight under a fixed pressure per unit of area should be the measure of resistance of the material to the abrasive attack. The comparator material was discovered to be Key steel, 0.08 to 0.12 carbon, and all determinations which follow in the table have been compared with the Key steel.

The machine especially developed for the abrasion tests rotated the machined doughnut-shaped gray iron disk through a worm gear mechanism. Circular 1-lb. weights operated directly on top of the materials being tested and were free to float in order to provide uniformity of load distribution. Feeders for the abrasive were cam actuated for a uniform rate of abrasive flow. Flow of water was controlled from the lubricator, and the water was fed into the center of the disk so that the slight centrifugal action uniformly cleansed the lapping disk of the accumulations of the materials being abraded.

Types of specimens tested were accurately dimensioned 1-in. squares in order to present 1 sq.in. of projected bearing area. These were prevented from rotating with the disk by means of V-shaped knife edges supported close to the lapping disk and were so held that a radius of the lapping disk is parallel with a diagonal of the square test specimen.

The information listed in the tables is the result of approximately 1400 determinations on practically all existing materials. Naturally, there are many variables which must be considered in actual practice. The data collected have been valuable as a guide in Link-Belt's selection of materials best adapted to serve a specific purpose.

ABRASION TEST VALUES

Heat-Treating Steels

S.A.E. No.	Brinell	Treatment	Comparative Wear Value
1040	156	As received	1.235
	269	Oil quench — No draw	1.436
	269	Oil quench — 450 draw	1.410
	255	Oil quench — 800 draw	1.353
3130	183	As received	1.258
	460	Oil quench — No draw	1.837
	402	Oil quench — 600 draw	1.651
	321	Oil quench — 900 draw	1.363
	248	Oil quench — 1200 draw	1.345
	477	Water quench — No draw	1.863
	311	Water quench — 1000 draw	1.387
3135	444	Oil quench — 600 draw	1.602
	430	Oil quench — 700 draw	1.727
3140	196	As received	1.483
	532	Oil quench — No draw	1.901
	555	Oil quench — 450 draw	1.946
	444	Oil quench — 600 draw	1.627
	311	Oil quench — 900 draw	1.483
	340	Oil quench — 1100 draw	1.577
3245	196	As received	1.303
	477	Oil quench — No draw	1.883
	418	Oil quench — 500 draw	1.692
	402	Oil quench — 700 draw	1.552
	321	Oil quench — 900 draw	1.485
	241	Oil quench — 1100 draw	1.331
5135	170	Annealed	1.412
	555	Oil quench — 300 draw	2.029
	512	Oil quench — 400 draw	2.342
	495	Oil quench — 500 draw	1.869
	460	Oil quench — 700 draw	1.858
	364	Oil quench — 900 draw	1.639
	293	Oil quench — 1100 draw	1.540
5140	163	Annealed	1.254
	600	Oil quench — 300 draw	2.375
	578	Oil quench — 400 draw	2.348
	555	Oil quench — 500 draw	2.192
	477	Oil quench — 700 draw	1.879
	387	Oil quench — 900 draw	1.788
	321	Oil quench — 1100 draw	1.604
5150	217	Annealed	1.451
	627	Oil quench — 300 draw	2.490
	600	Oil quench — 400 draw	2.308
	555	Oil quench — 500 draw	2.163
	512	Oil quench — 700 draw	1.870
	418	Oil quench — 900 draw	1.700
	332	Oil quench — 1100 draw	1.674
4150	187	Annealed	1.399
	600	Oil quench — 300 draw	2.305
	578	Oil quench — 400 draw	2.253
	555	Oil quench — 500 draw	1.988
	495	Oil quench — 700 draw	1.874
	444	Oil quench — 900 draw	1.782
	364	Oil quench — 1100 draw	1.785
4650	170	Annealed	1.239
	627	Oil quench — 300 draw	2.416
	600	Oil quench — 400 draw	2.360
	555	Oil quench — 500 draw	1.980
	477	Oil quench — 700 draw	1.886
	387	Oil quench — 900 draw	1.767
	311	Oil quench — 1100 draw	1.564
6150	202	Annealed	1.488
	652	Oil quench — 300 draw	2.428
	627	Oil quench — 400 draw	2.268
	600	Oil quench — 500 draw	2.100
	512	Oil quench — 700 draw	1.904
	418	Oil quench — 900 draw	1.807
	321	Oil quench — 1100 draw	1.543

Heat-Treating Steels — (Continued)

S.A.E. No.	Brinell	Treatment	Comparative Wear Value
1350 Cast Steel	207	As cast and annealed	1.457
	460	Oil quench — No draw	1.963
	445	Oil quench — 600 draw	2.012
	321	Oil quench — 900 draw	1.625
	255	Oil quench — 1100 draw	1.529
1025 Cast Steel	149	As cast and annealed	1.130

Case-Hardening Steels

S.A.E. No.	Rockwell	Treatment	Comparative Wear Value
1020	63-C	Carburized — One reheat	2.130
	58-C	Carburized — No reheat	2.117
2320	64-C	Carburized — One reheat	2.012
	58-C	Carburized — No reheat	2.073
3120	56-C	Carburized — No reheat	2.044
	56-C	Carburized — One reheat	1.922
4615	56-C	Carburized — No reheat	2.117
	56-C	Carburized — One reheat	1.785
6115	65-C	Carburized — Reheat	2.010
5120	60-C	Carburized — Reheat oil quench	1.935
	65-C	Carburized — Reheat water quench	2.400

Rustless Steels

Type	Brinell	Treatment	Comparative Wear Value
.30 C — 14.00 Cr	241	As received	1.430
	627	Oil quench — No draw	2.074
	512	Oil quench — 600 draw	1.907
	477	Oil quench — 900 draw	2.028
	277	Oil quench — 1200 draw	1.462
	241	Oil quench — 1400 draw	1.391
.12 C — 13.00 Cr	460	Oil quench — 300 draw	1.643
	418	Oil quench — 600 draw	1.598
	418	Oil quench — 800 draw	1.865
	387	Oil quench — 1000 draw	1.774
	241	Oil quench — 1200 draw	1.341

Miscellaneous Steels

Sample	Comparative Wear Value
Hadfield Manganese Steel — Cast — Work Hardened	2.352
Wrought Iron	1.021
Armco Iron	1.038

Cast Irons

Material	Treatment	Brinell	Comparative Wear Value
Malleable Iron	None	120-140	Rim 1.017 Core .894
Promal		170-190	1.239
White Chrome Iron			1.495
Chilled Iron			1.575
White or Hard Iron		380	1.804
Soft Gray Iron	Annealed	150	.303
Good Gray Iron		190	.509

Bronzes

Material	Treatment	Brinell	Comparative Wear Value
Aluminum Bronze	88% Copper, 9% Aluminum, 3% Iron	101	.776
Aluminum Bronze	90% Copper, 10% Aluminum	...	.629
Phosphor Bronze		52	.378
Manganese Bronze		107	.549

Abstracted from a paper "Relative Wear of Metals due to Abrasion", by C. R. Weiss, Ewart Works, Link-Belt Co., contributed for presentation at the M-M-M Congress, in Detroit, May 4-5.

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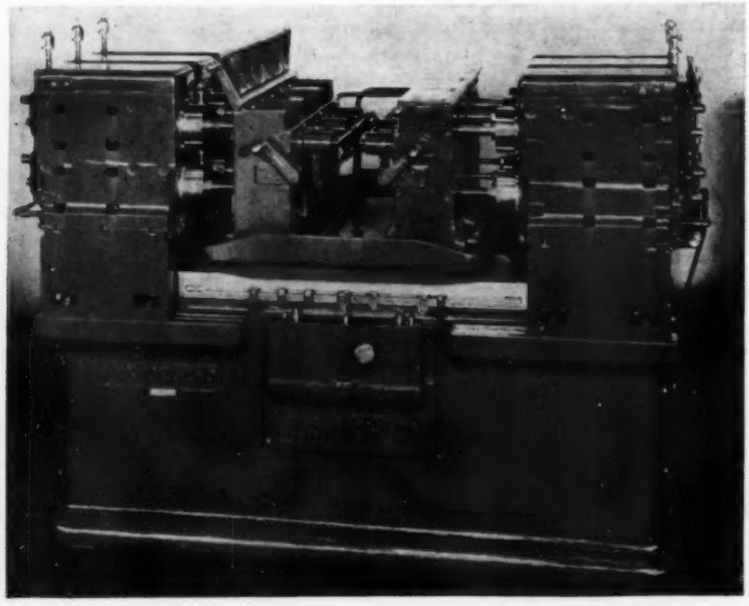
SHOP EQUIPMENT NEWS

Ex-Cell-O Model 216A Precision Boring Machine

A MODEL 216A, replacing Model 216, the larger of two precision boring machines manufactured by the Ex-Cell-O Aircraft & Tool Corp., 1200 Oakman Blvd., Detroit, Mich., embodies several improvements. A straight-line effect has been carried out on the entire machine. A pedestal foot-type base has been adopted so that chips, dirt or water cannot collect around the bottom of the base. Over-all height of the machine has been reduced 5 in., making the center distance of the individual boring units 42 in. above the floor line, thus making it easier for the operator to load and unload the holding fixture. Over-all length has been increased 4 in. and is now 74 in. long. The width remains the same, 23 in.



The table supporting the holding fixture has a V and flat way, each of which are provided with forced-feed lubrication. The method of mounting the bridges on the base has also been changed. Formerly, one surface was flat and the other a V-shape. On the Model 216A both surfaces which fit on the base are flat. A T-slot is provided in the bridge rail on the base and a vertical hole is drilled in the bottom of the bridge face to accommodate the T-bolts. In addition to the T-bolts for holding the bridge in position, hook bolts are employed for drawing the bottom of the bridge against a scraped edge on the bridge rails.

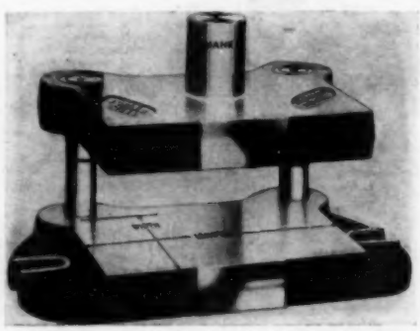
The bracket for supporting each boring unit has also been re-designed. Mounting lugs for holding these brackets have been eliminated. The brackets are mounted on the bridge by T-bolts. These bolts are locked in place by means of a taper wedge action through a taper cross bore in the T-bolts. This method allows the brackets to be mounted tight against each other, holding the center distances between boring units to a minimum. Two opposed micrometer screws are located on the inside face of the bridge for lining each boring unit in horizontal position.

A hydraulic brake unit is provided for stopping the boring tool as soon as the finishing cut is completed. The hydraulic cylinder operating each boring unit brake is now located on the back end of the spindle bridge directly below the individual brakes. A valve for controlling coolant is mounted on the back of the machine just below the fixture table level. It is actuated by an adjustable dog as the table reciprocates.

Six boring units are used on each end of the machine. The bottom row of units bores the bronze bushing on the small end of the connecting rod, and the top row bores the babbitt in the large end of the rod. The holding fixture is hydraulically operated. Rods are dropped into approximate locating nests, and the clamping method is so arranged that the rods are seated against their locating points and against the face of the rod before being clamped in position. Three rods are loaded on one side of the fixture while three rods on the opposite side are being bored. Production per hour is approximately 350 complete rods. Approximately 0.010 to 0.012 in. of stock is removed on the diameter.

Baumbach Drop-Forged Steel Die Sets

Drop-forged steel die sets are now being manufactured by the E. A. Baumbach Manufacturing Co., 1812 S. Kilbourn Ave., Chicago, Ill. These die sets have the die shoes and punch holders drop-forged from 35-



Working surfaces and leader pins are machined and ground

40 carbon steel completely normalized. Shanks are drop-forged as an integral part of the punch holder. Working surfaces are machined and ground. The punch holders are fitted with bushings made of high-manganese steel carbonized, hardened, ground and lapped to fit on each hardened and ground leader pin. Because of the materials employed, it is said that the weight of these die sets can be reduced as heavy thicknesses are not required. A stock of these die sets is carried.

"Footburt" 5-Way Drilling Machine

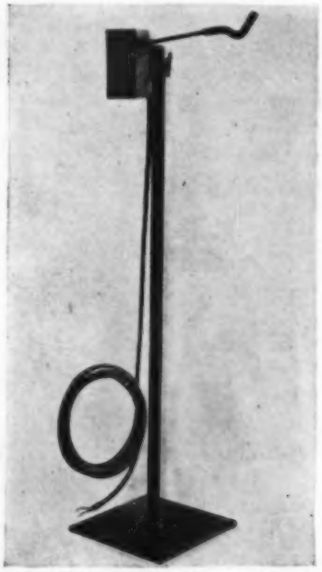
HAVING a total of 90 spindles and incorporating latest developments in way drilling equipment, a special 5-way multiple spindle drilling machine has been furnished by Foote-Burt Co., Cleveland, Ohio, for drilling a V-type cylinder block. It has one vertical head, two upper angular heads and two lower angular heads and is of unit type construction, each drilling unit being complete within itself with individual motor drive. The frame of the machine is constructed of heavy castings to give rigidity and furnish support for the fixture and drilling units.

Heads are driven by the latest drum-type cam units, the vertical unit and two upper angular units having 14-in. diameter cams and the two lower angular units 10-in. diameter cams. The most suitable size of cam unit was used on each way; due to the small number of spindles on the lower angular heads, it is possible to use a smaller unit than is necessary for the upper angular and vertical heads. Ways for these units are extra wide; slides are long and provide necessary support. All units are driven by standard foot-mounted ball bearing motors to permit interchangeability. All heads and cam units have individual lubricating systems with sight feed gages.

One throw-in lever operates all drilling units. One fixture clamping lever clamps and locates the part and also moves the guide bushings in close to the work in a single operation. The throw-in lever starts the cycle of all units simultaneously.

Lincoln "Power Saver" Electrode Holder Stand

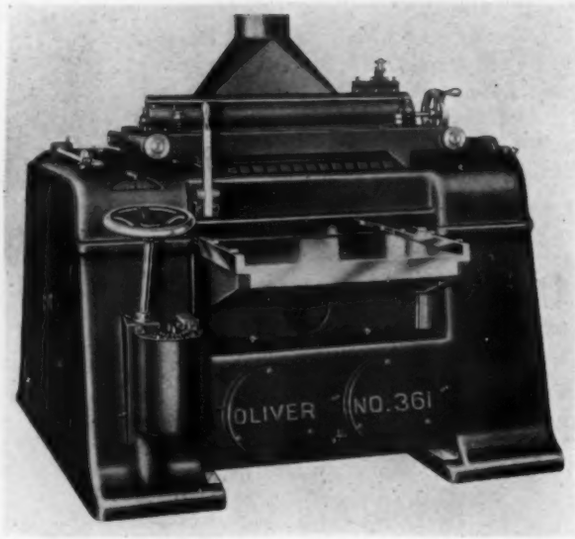
An electrode holder stand that automatically shuts down the welder one minute after the holder is placed on the stand and instantly starts the welding set when the holder is removed has been announced by The Lincoln Electric Co., Cleveland, Ohio. It is said that the automatic start-and-stop feature of the "Power Saver" stand effects savings in power consumption and improves the over-all power factor of the plant. When the hook is depressed by the weight of the holder, it actuates a special timing device which, at the end of one minute, disconnects the welding set from the power supply line. When the holder is removed from the hook the welder starts automatically. The holder hook can be raised or lowered on the upright member to suit the convenience of the operator. The "Power Saver" can be used whenever the welding equipment is provided with an automatic motor starter having two-wire pilot control.



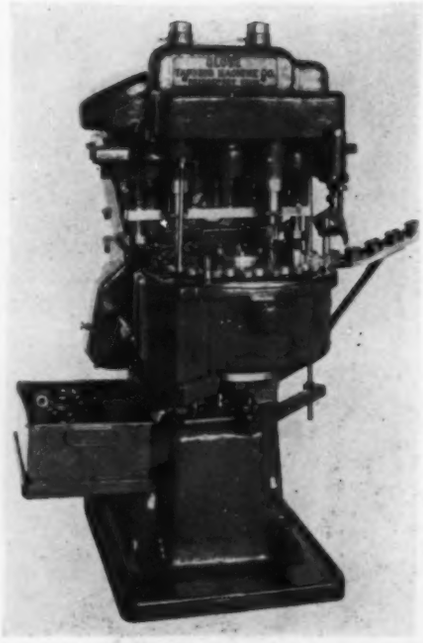
Oliver No. 361 Single Wood Planer

For the larger pattern shops, the Oliver Machinery Co., Grand Rapids, Mich., is introducing its No. 361 single wood planer, which is built in two sizes to plane 30 and 36 in. wide and up to 8 in. thick. All moving parts of the planer are mounted on ball bearings, and ball-bearing thrusts are

provided for table wedge screws. Complete control from a central location is a feature, as well as the accessibility of all adjustments of the rolls and chipbreaker. The No. 361 is of the inclined wedge type of bed. It is also built in a screw-raising type, and is then known as the No. 261. A large handwheel provides the fine hand adjustment of height required, while the power feed raising and lowering mechanism provides faster adjustment. The head is balanced to run at any high-frequency planer speed desired, but is normally operated on 60 cycles, giving 3,600 r.p.m.



The sectional chipbreaker of alloy cast steel may be swung upward when required to be out of the way. The sectional feed roll is of the same design as used on the Oliver "Straitoplane." The four standard feeds of 20, 40 and 60 ft. per min. are obtained by means of a separate four-speed built-in feed motor operated through a silent V-belt drive and inclosed oil immersed worm and worm gear. The knife grinding bar is built in. A grinding head and jointing attachment are quickly applied. The 30-in. machine weighs approximately 8,500 lb. and the 36-in. machine, 9,000 lb. The head is operated by a 10- to 20-hp. motor, depending upon the work to be performed. For the 30 in. machine the feed motor is 1½ hp. and for the 36-in. unit, 2 hp.

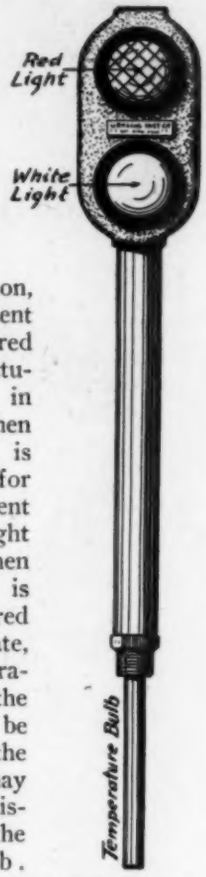


Globe Automatic Drilling and Countersinking Machine

The Globe Tapping Machine Co., 751 Central Ave., Bridgeport, Conn., has developed an automatic drilling or counter-sinking machine adapted for many kinds of work. The machine illustrated is equipped with two heavy-duty spindles carrying ⅝ x 1¼-in. spot-facing cutters for facing off the protruding inner-shaft bushing of a commutater at a rate of 20 finished pieces per minute. One operator is able to load the chutes on several machines, as the parts are fed automatically into the dial from the chute. Ejection of the finished parts is automatic.

By having two ball-bearing spindles, one for roughing and one for finishing, the parts are finished free from chatter marks. If the dial should fail to index properly due to any abnormal resistance, the automatic mechanical trip will prevent the head from coming down, thus eliminating damage to the dial or cutters. The main drive consists of a hardened and ground nickel-steel worm mounted on ball bearings and meshed with a phosphor-bronze worm gear carried on two large roller bearings. The motor is mounted on a tilting plate in the base.

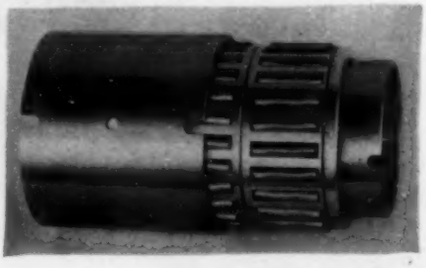
"Thermo-Tel" Electric Signal



A device for determining temperature by means of electric lights, and known as the "Thermo-Tel," has been developed by the Uehling Instrument Co., Paterson, N. J. The instrument consists of colored electric lights, actuated by changes in temperature. When the temperature is within the limits for which the instrument is set, a white light will illuminate, when the temperature is above the limits, a red light will illuminate, and when the temperature is below the limits all lights will be out. If desired, the signaling lights may be located at any distance away from the thermometer bulb. Accuracy to within one-tenth of one deg. F. is claimed.

Bantam Special Roller Bearing

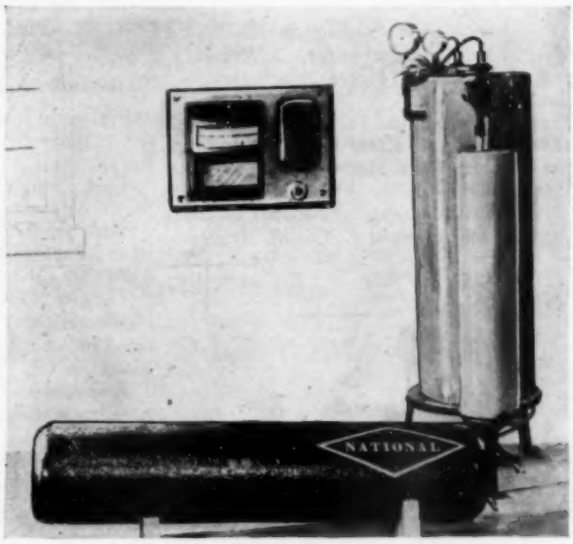
A special double-row cylindrical roller bearing, designed especially for journals on plate and impression cylinders of newspaper printing presses, but adaptable for other types of equipment, is being offered by the Bantam Ball Bearing Co., South Bend, Ind. The bearing has two sets of rollers, operating in independent cages so as to minimize skew effect of rollers. One cage has 23 rollers, the other 24, giving a "hunting tooth" effect toward the elimination of synchronized vibration of cylinders.



The bearing is made for use in limited space. On the standard type the rollers are ½ in. in diameter and the races have ¼-in. wall thickness. The rollers and races have a lapped finish and both are made of high-carbon, high-chromium bearing steel, hardened by heat-treatment.

Ajax Ammonia Dissociator

Hydrogen and nitrogen, or a mixture of these gases, are used in many industrial processes which demand a reducing or inert atmosphere. However, the cost of these gases is higher when purchased in cylinders than when cracked by the ammonia dissociation process. Therefore the Ajax Electric Co., Philadelphia, Pa., has developed an apparatus to yield a dry gas containing 75 per cent hydrogen and 25 per cent nitrogen, using anhydrous ammonia as the raw material. A standard cylinder of 100 lb. of ammonia will yield 4,500 cu.ft. of dissociated gas. Based on an ammonia cost of 16 cents per pound, and a power cost of 2 cents per kw-hr., the cost of the dissociated gas is $3.68 per 1,000 cu.ft. in an average size unit. Dissociators are offered in the following sizes: 50, 150, 300 and 500 cu.ft. per hour, complete with controls.



The machine has two individual spindles, each operated independently of the other. Each has its own motor, own multi-V belts for transmitting the power to the spindle, its own automatic motor starter with overload, low voltage, and phase failure protection, and its own spindle lock.

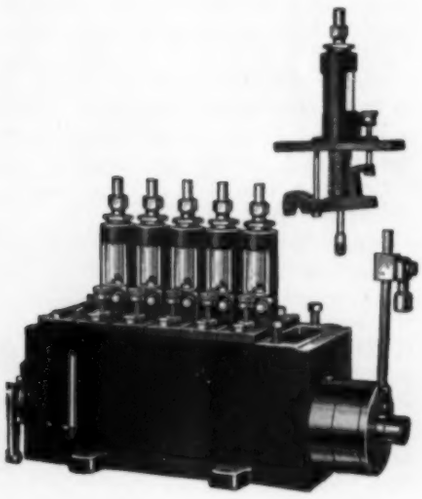
Constant wheel periphery speeds can be maintained on each spindle from largest diameter to scrap size by equipping the machine with the Hammond variable speed pulley. When so equipped, the unit is designed with a safety device so that large wheels cannot be operated at too high a spindle speed.

Wheel guards are of heavy boiler plate steel, welded and riveted, having hinged doors and equipped with adjustable spark deflectors, and are built in accordance with the A.S.A. recommendations. The motor is totally inclosed, fan-cooled, mounted on a screw-feed bracket to provide adjustment for multi-V belts.

The "Cascade" oiling system illustrated is not standard equipment but can be supplied as an extra. Glass-front oil level gage and pressure indicator are standard equipment. The machine is built by Hammond Machinery Builders, Inc., Kalamazoo, Mich.

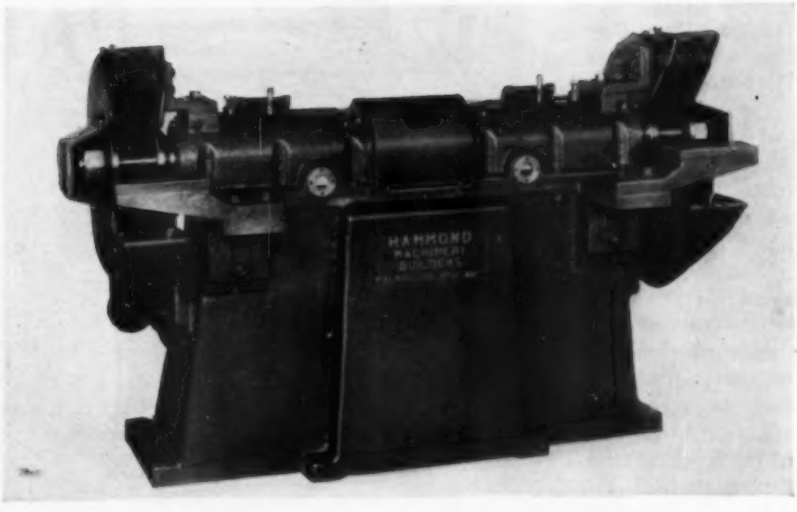
Bowser Fig. 451 Force Feed Lubricator

A force feed lubricator equipped with liquid-filled sight glasses has been announced by S. F. Bowser & Co., Inc., Fort Wayne, Ind. A single plunger serves the dual purpose of drawing the oil from the reservoir and forcing it in a straight vertical path through the sight glass to the point of lubrication at the end of the feed line. Each pumping unit is



Hammond High-Speed Grinder with Independent Spindle Control

Planned to eliminate the disadvantages of similar types of floorstand grinders and to provide a new high operating efficiency for all snagging and rough grinding work, this machine can use either Bakelite or rubber-bonded wheels at surface speeds of 9,000 ft. per min., as well as vitrified wheels operating at the usual 6,000 surface ft. per min. Larger spindles and bearings, stronger materials and precision workmanship are claimed to permit these higher speeds.



individually adjusted and removable while the lubricator is in operation. A simple method of refilling the sight glass has been incorporated. A standard lubrication fitting permits injection of the liquid by means of a grease gun. The new lubricator, designated as Fig. 451, can be furnished with any number of feeds and with any type of driving mechanism required.

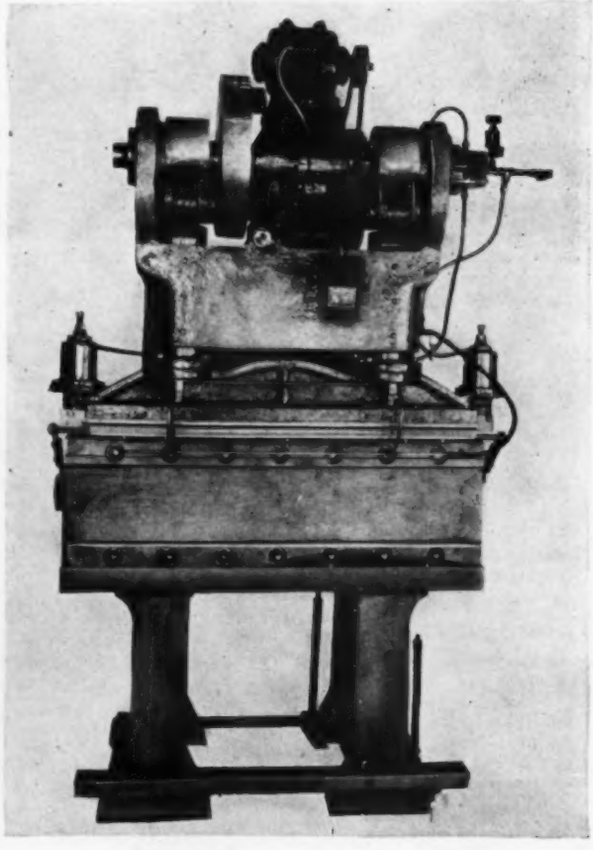
Norin Electro-Mechanical Press With Wide Dies

An adaptation of the design of the electro-mechanical riveter previously described (*AM*—Vol. 75, page 399) has been applied in a press for drawing sheet metal pans, made by the Norin Engineering Co., 355 Union Park Court, Chicago, Ill. While the principle of the electro-mechanical drive is retained, the details have been varied to take care of the wide die employed on this special work. The crosshead is guided by two plungers, connected by links and crank levers to the double-throw crankshaft.

Pressure developed is 70 tons, and the normal operating speed is 40 cycles per min. A 1½-hp. motor furnishes the drive. Power from the electric motor is stored in a flywheel and is transmitted through a clutch of special design arranged to release and reverse when a predetermined load is reached on the ram. As the load is released, another set of clutch pins engages a gear driven in the opposite direction, so that a return motion is effected. When the press is operated without any work, the release clutch is automatically actuated when the crank-shaft has turned 145 deg.

No screw adjustment is provided for what corresponds to the crank-shaft of an ordinary press, since full pressure control, regardless of the thick- of the stock, is effected through the clutch mechanism. Pressure may be adjusted from zero to the full capacity of the press, and the point of return of the crosshead is a function of this pressure and not of the position of the stroke.

The yoke frame is a steel casting mounted on a cast-iron base.



• PATENTS •

MAY 31, 1932

Metal-Working Machinery

Mechanism for Truing and Dressing Grinding Wheels of Centerless Grinders. Ferdinand J. Hohnhorst and Ferdinand J. Kroeger, Covington, Ky. Patent 1,860,614.

Machine Tool. William H. Bauch, Shelbyville, Ind., assigned to Indiana Foundry Machine & Supply Co. Patent 1,860,700.

Axle Grinder. Henry H. Yerk and William J. Baumberger, Davenport, Iowa, assigned to Micro Machine Co. Patent 1,860,794.

Grinding Machine. Henry H. Yerk and William J. Baumberger, Davenport, Iowa, assigned to Micro Machine Co. Patent 1,860,795.

Grinding Machine. Henry H. Yerk and Arthur A. Kottman, Davenport, Iowa, assigned to Micro Machine Co. Patent 1,860,796.

Milling Machine. Newman M. Marsilius and Oswald A. Olsen, Bridgeport, Conn., assigned to The Producto Machine Co. Patent 1,860,840.

Electric Welding Apparatus. William H. Gibb, Bay City, Mich., assigned to Thomson-Gibb Electric Welding Co. Patent 1,861,005.

Apparatus for Electric Welding. Henry S. Holmes, Rockville Center, N. Y., assigned to Metropolitan Engineering Co. Patent 1,861,011.

Radial Drill. William L. Schellenbach, Wyoming, Ohio, assigned to The American Tool Works Co. Patent 1,861,030.

Horizontal Drilling Machine. Frank W. Haeger, Saginaw, Mich., assigned to General Motors Corp. Patent 1,861,055.

Power Press. Meredith R. Hatch and Arthur H. Schloz, Toledo, Ohio, assigned to The Toledo Machine & Tool Co. Patent 1,861,181.

Grinding Machine. Maxwell I. Mathewson, Providence, R. I., assigned to Brown & Sharpe Manufacturing Co. Patent 1,861,279.

Hydraulic Metal Drawing Press. Walter Ernst, Mount Gilead, Ohio, assigned to The Hydraulic Press Manufacturing Co. Patent 1,861,337.

Tapping Machine. Judson H. Mansfield, Rockford, Ill., assigned to Greenlee Bros. & Co. Patent 1,861,350.

Tools and Attachments

Pressure Regulator. Frank S. Lawrence, Dunellen, N. J., assigned to Air Reduction Co., Inc. Patent 1,860,350.

Tool Holder. John Drazick, Detroit, Mich. Patent 1,860,998.

Multiple Drilling Mechanism. Wallace W. Smith, Chicago, Ill. Patent 1,861,099.

Turning Device for Flat Sided Rivets. Frederick M. Littell and Edgar R. Miller, Chicago, Ill., assigned to F. J. Littell Machine Co. Patent 1,861,186.

Adjustable Tool Holder. John Hugo Smith, Detroit, Mich. Patent 1,861,246.

Die Head. Harry T. Shearer and Charles A. Reimschissel, Waynesboro, Pa., assigned to Landis Machine Co. Patent 1,861,327.

• TRADE PUBLICATIONS •

BALL BEARINGS. New Departure Mfg. Co., Bristol, Conn., has issued a leaflet "Lubrication of New Departure Ball Bearings" in which lubrication of ball bearings by oils and grease is discussed at length, and in which is a chart that deals with the four variables that must be considered in selecting a proper lubricant. These variables are speed, temperature, moisture and bearing types.

FLEXIBLE COUPLINGS. Bulletin 102 describes flexible couplings and illustrates many different applications and special set-ups. It is issued by American Flexible Coupling Co., Erie, Pa.

EDITORIALS

June 9, 1932

K. H. CONDIT • F. H. COLVIN
Editors

Revive the Heavy Industries

Now that the banks have been rescued, the budget has been balanced—on paper, at least—and relief measures are well on their way, isn't it about time we did something to revive the heavy industries? Through no fault of their own these industries are responsible for the major part of the unemployment that is pulling all of us deeper into distress.

What do the statistics show? That the consumer industries are down to from 70 to 90 per cent *of* normal, while those that make machinery and other producer goods are off corresponding percentages *from* normal, which means that they are operating at from 10 to 30 per cent.

No matter how adept at staggering hours and rotating jobs a management may be it cannot help but add to the ranks of the unemployed when it can run a plant at only one-quarter capacity, or less. This fact ought to be obvious under any conditions, but the most stubborn doubter should be convinced by what has happened during the last two years.

Relief of suffering is one thing, revival of business is something quite different. The most economical method of providing relief is by direct expenditure of dollars through existing relief agencies. Those who claim to know tell us that one dollar spent in this way goes as far as seven dollars spent for public works. Just how far money spent for public works will go in speeding up business revival is not clear. Again, those in a position to know assure us that it will bring new money into the business stream that will work all the way back through the various sources of supply to the basic construction materials themselves.

Even so, the stimulating effect on the heavy industries, source of most of our unemployment, will be relatively feeble. Not a great deal of new machinery will be needed for public works projects, and what there is will be supplied by a relatively limited number of companies.

If we are really to make headway in reconstruction, positive action must be taken to revive the heavy industries. As readers of *American Machinist* know well, there are vast numbers of obsolete machine tools in the plants of the country. The same condition of obsolescence obtains in the power plants, on the railroads, in the textile mills and in other equipment-using industries. Operating men are eager to make some sort of start toward getting ready for economical production when orders come in. A judicious stimulation of credit extension for modernization of plant facilities would do more than any one thing to turn the tide of increasing unemployment. We recommend a study of this proposal to the Young Committee and to corresponding committees in other Federal Reserve districts, to the Reconstruction Finance Corporation, and to the Administration and members of Congress.

Fair Play

Regularization of employment by production of stock parts during off seasons is one of the good ideas that apparently went by the boards when every season became an off season. There are definite indications, however, that plans for smoothing out seasonal fluctuations have not been forgotten and will again be used. These plans are not being laid for that vague period when things get back to "normal" but specifically for the coming winter.

One prominent automobile manufacturer expresses keen appreciation of the excellent temper of his workmen whose pay has been reduced by the short working week. Although employed only an average of 30 hours weekly, these men have main-

tained their morale and have shown willingness to cooperate with their employer in reducing costs. This fine spirit will be recognized by the manufacture of parts for stock to keep the maximum number on the payroll.

The executive referred to states that other manufacturers would do well to adopt this same policy. The extreme swing from high inventories to low inventories has gone far enough. It is time now to consider the social factors involved and to realize that it is good business to spend money when it will do most good to workers who have cheerfully carried on during an economic crisis.

• CHIPS •

"A Paul Revere's ride" says Senator Pat Harrison, belittling Hoover's trip to Congress following a sleepless night . . . at any rate Congressional minute men rallied, passed the tax bill in both houses, speeded economy and relief programs . . . Federal 10 per cent pay cut seems now assured . . . "Bonus Expeditionary Force" gathers at Washington . . . forces vote on Patman bill for cash payment . . . an ominous attempt at coercion . . . House Democrats push Garner relief bill . . . Contains no pork, says sponsor . . . But the President disagrees . . . proposes substitute plan to increase R.F.C. issues to $3,000,000,000 . . . to make loans to states, farmers and home owners . . . but to avoid expansion of the public debt for non-productive public works . . . 3-day Republican convention planned at Chicago . . . but Democrats will need longer . . . Both parties may indorse resubmission plank, the latest form of straddle.

Lamont heads $100,000,000 bond pool, and bonds rise in anticipation . . . Railroad Credit Corporation loans now total $22,000,000 . . . Pennsylvania's request for $27,500,000 from R.F.C. gets O.K. . . . Illinois Central now wants $11,000,000 . . . U. S. public debt now totals $19,000,000,000 . . . fifteen times 1917 figure, but $7,000,000,000 under war peak in 1919 . . . National Tax Conference urges lower taxes . . . blames public indifference for present economic plight . . . Business failures drop from 613 to 569 in week . . . bank failures from 21 to 9 . . . Potential use of copper for air conditioning estimated at 3,500,000 lb. yearly.

Association of Railway Executives asks public aid in promoting reforms . . . recommends modernization, elimination of duplication, pooling of passenger facilities . . . Boston & Maine inaugurates 36-hour fast freight service from New York to certain New England points . . . from door to door on l.c.l. shipments . . . I.C.C. reports 3,000 rise in railroad employees as of April 1 . . . Western Electric cuts working week to 4½ days . . . Chrysler May shipments are 24 per cent over 1931 . . . Usual June crop of graduates leaves universities, but business is not ready to absorb them . . . 578 kw.-hr. per capita electric consumption in 1931 sets a new record . . . increase in rural usage more than offsets industrial loss . . . Industry starts buying materials believing bottom prices are here.

United States agrees to join world trade parley but wants it separated from Lausanne . . . and from discussions of reparations, war debts and tariffs . . . Young may be U.S. representative . . . Von Papen succeeds Bruening as German Chancellor . . . dissolves Reichstag to forestall adverse vote . . . New German elections to be held in July . . . American methods are studied by a delegation of European steel men . . . Japs now face outlay of $65,000,000 to pay for "protection of rights" in China . . . but prepare to colonize Manchuria . . . Herriot completes moderate cabinet as France adopts more tolerant trade quotas . . . Soviet imports increased 25 per cent by volume in 1931 . . . but only 4 per cent in value because of price drop . . . Chile's president ousted in Socialist rebellion . . . Davila says foreign property is safe.

$263,750 contract for elevators in the new Agriculture Extension Building, Washington, D. C., is awarded to Westinghouse . . . United Air Lines will replace most of its flying equipment at a cost of $2,000,000 . . . Payments to air mail operators for the first quarter were 10 per cent over 1931 . . . miles flown on mail routes were up 47 per cent for the same period . . . 10-day exhibit at Buffalo netted $31,000 in sales of electric refrigerators . . . New Orleans City Council authorizes a $700,000 public market with $75,000 worth of ice-making and refrigerating equipment . . . Plans are approved for $10,000,000 dam in San Gabriel Canyon, Calif. . . . United Action Drive to put 1,000,000 men to work reports 874,258 employed . . . in 3,050 towns and cities.

· REGIONAL · REPORTS ·

DETROIT—Increasing schedules of automobile production constitute a somewhat optimistic outlook for the machinery and machine tool trade, but nothing has happened yet in the way of sales or inquiries to make this optimism tangible. There is a feeling that the summer will be at least as dull as the first half of the year. But optimism does break out in spite of discouraging sales records.

At least two of the big producers of automobiles are planning extensive changes in design. Others are considering less extensive changes. Ford production is still advancing. Much of the work is being let out to contract jobbing shops, and there is some possibility that these shops may need new equipment if Ford work continues to grow in volume.

CINCINNATI—In spite of the Memorial Day holiday, the demand remained at about its former level. Business booked was in the main from scattered general machinists and miscellaneous users who bought single items. A fair number of small inquiries came from various classes of users.

CHICAGO—No change is apparent in this center. Few orders are being placed, and those only for forced replacement. No lists have been issued. A large backlog of inquiries has accumulated, but no action is expected. Some used tools are being sold.

NEW YORK—Conditions in this area are much as they have been, but two concerns have been able to dig up some business. One got an order from the Navy for a drilling machine and sold some sheet-metal machinery to contractors on Radio City. Another sold 13 drilling machines to Wright Field, and reports success with state institutions. The main sources of business—industrials—are out of the market entirely.

NEW ENGLAND—The week developed little of importance to discuss in the machine tool market. When mid-summer dullness sets in before winter is hardly over there is nothing tangible to offer the trade by way of encouragement. Orders filter through the maze of dullness from the few outstanding sources, which have been the only prominent buyers, namely, the Navy, the automobile industry and the Soviet Government. These are usually for one machine.

Salesmen have no difficulty interesting prospects in needed machine tools or production units, but it becomes another thing again to put finis on any tool proposition. A good many dealers are going a week or more without any sign of an order.

Plants are gradually turning to plans for the production of new products offering brighter sales prospects. Air conditioning units and coordinated products are a source of strenuous engineering efforts.

SOUTHERN DISTRICT—Purchases in this section are still dictated by final break-down of existing equipment, and few inquiries are reported. An occasional order comes through from industrial plants or the oil fields. Railroad buying is negligible and there seems to be little chance of any until petitions for loans by local roads are approved.

SAN FRANCISCO—Sales of metal-working machinery are now at a standstill. Few inquiries are reported. However, some sales are being made in other lines. Demand for shop supplies is light.

THE WEEK past has been one of belated political achievement, and it is plain that a long hard pull is in store for industry and consumer alike. Provided Congress does not play to the grandstand too much with regard to the important measures still before it, and impose too many additional loads on a tax-ridden country, it is probable that conditions will improve slowly. With confidence nurtured carefully, the flow of consumer goods should accelerate. This should bring with it a stiffening of commodity prices and better profit margins to producers. When this occurs it will be time for manufacturers of consumer goods to consider purchase of much needed equipment. And it is evident from the large number of inquiries in the hands of machine builders and dealers that the need for new equipment is acute. For some time yet the motto must be "Faith, Hope and Charity," with not too much charity.

NEW ENGLAND is very dull in the larger part of the picture but still reports some buying from the Navy, automobile interests and Amtorg. Cincinnati has no change to report. New York is decidedly spotty, some dealers reporting nothing and others the picking up of some stray business out of main channels. Detroit is still hopeful that the continued drive by its big industry will produce something tangible. If Ford production goes up enough the jobbing shops may buy. Chicago is particularly dull, but some used tools are being sold.

MATERIAL TRENDS AND PRICES

Declines which affected scrap prices generally, in the last week, have abated apparently in all except certain descriptions of brass and copper. Fuel prices continue to sag. Zinc rose 0.25c. per lb., to 2.85c., E. St. Louis, while tin dropped 0.6c., to 20.5c., New York, during the week. Lead remains at 2.90c., E. St. Louis, it's level since Apr. 8. Finished-steel prices show no tendency toward change.

(All prices as of June 3, 1932)

IRON AND STEEL

Pig Iron —	Current	Mo. Ago	Yr. Ago
Birmingham, No. 2, Fdry., per gross ton	$11.00	$11.00	$12.00
Buffalo, No. 2, Fdry., per gross ton	16.00	16.00	17.00
Heavy Melting Steel Scrap — Pittsburgh consuming point, No. 1, per gross ton	9.50	9.75	10.30
Furnace Coke — Connellsville, per net ton	2.00	2.25	2.40
Foundry Coke — Connellsville, per net ton	3.00	3.25	3.25
Steel Shapes — Pittsburgh, base, per 100 lb.	1.60	1.60	1.65

Iron Machinery Castings — Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight, 275 lb:

Chicago....4.62½	Cleveland....4.50	New York....4.75	
Cincinnati....4.35	Detroit....4.00		

Steel Sheets — Prices in cents per lb., del. from warehouse stock (except at Pittsburgh) in lots of 401 to 999 lb., ordered and released for shipment at one time:

	Pitts. Mill	Chicago	Cleveland	New York
Hot-rolled, No. 10	1.55	3.20	3.00	3.00
Hot-rolled, No. 24*	2.20	3.55	3.25	3.50
Galvanized, No. 24	2.85	4.10	3.75	4.00

*Annealed

Seamless Steel Tubing — Cold-drawn mechanical tubing, round, .10 to .30 carbon, in lots of less than 100 ft. or 100 lb., net, at N. Y. warehouse:

— Thickness —		Outside Dia. in Inches						
of Wall		⅛	¼	⅜	½	1	1⅛	1¼
Inches	B.w.g.	Price per Foot						
.035	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23

Shapes, Plates, Bars, Etc. — Warehouse base prices in cents per lb., del. in lots of 401 to 999 lb., ordered and released for shipment at one time:

	New York	Cleveland	Chicago
Bands	3.40	3.00	2.95
Bars, soft steel	3.10	2.75	2.75
Cold fin., flat or square	3.80	3.60	3.60
Cold fin., round or hexagon	3.30	3.10	3.10
Cold rolled strips	4.95	5.95	5.50
Floor plates	4.85	5.00	5.00
Hoops	3.75	3.55	3.50
Rivets	4.00	3.30	4.00
Shapes	3.10	2.95	3.00
Spring steel	4.00	4.00	4.00
Tank plates	3.10	2.95	3.00

Stainless Steel — Hot-rolled bars, base, Pittsburgh, 0.12 per cent carbon, cents per lb.:

Chromium 15% and under....19.00	Chromium 18 to 23%....23.00
15 to 18%....20.50	23 to 30%....28.00

Bolts and Nuts — Discount from list, f.o.b. mills, Birmingham, Chicago, Cleveland and Pittsburgh, on bolts (except stove), nuts, and lag screws, mill lots.... 75%

NON-FERROUS METALS

Prices following are in cents per lb. for mill shipments in carlots:	
Aluminum ingots 99%, N. Y.	23.30
Copper, electrolytic, Conn	5.25
Copper wire, base, Chicago and Cleveland	8.12½
Copper wire, base, N. Y.	8.00
Lead, pigs, E. St. Louis	2.90
Tin, Straits, pigs, spot, N. Y.	20.50
Zinc, slabs, E. St. Louis	2.85
Prices following are in cents per lb., base, N. Y., Chi. and Cleve.:	
Brass rods, high	9.75
Brass sheets, high	12.00
Brass tubing, high	15.25
Copper, drawn round	12.37½
Copper sheets	14.87½
Copper tubing	14.37½
Prices following are in cents per lb., del. from N. Y. warehouse:	
Babbitt, anti-friction, general service	27.00
Babbitt, com'l, intermediate grade	32 75
Babbitt, genuine, highest grade	43.00
Solder, bar, 40-60	16.00
Prices following are in cents per lb., base, Huntington, W. Va.:	
Monel metal rods, hot rolled	35.00
Monel metal sheets, full finished	42.00
Monel metal tubing, seamless	65.00
Nickel rods, hot rolled	45.00
Nickel sheets, full finished	52.00
Nickel tubing, seamless	75.00

Scrap Non-Ferrous Metals — Dealers' purchasing prices in cents per lb., f.o.b. cars:

	New York	Cleveland	Chicago
Heavy yellow brass	1.75	1.25	1.50
Light brass	1.25	1.00	1.25
No. 1 rod-brass turnings	1.75	1.75	1.25
Heavy copper	3.50	2.50	2.62½
Light copper	2.75	2.25	2.12½

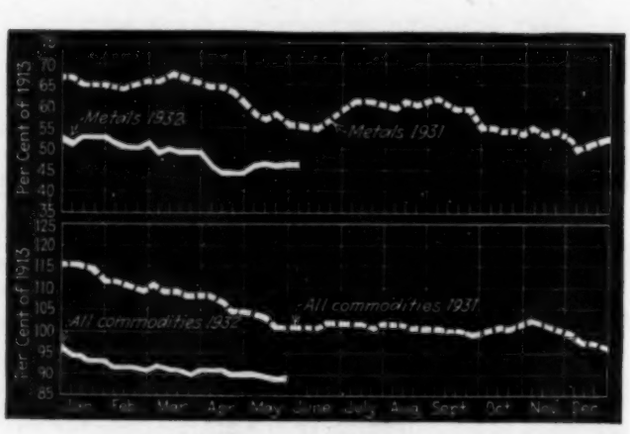
SHOP SUPPLIES

(Prices at warehouse)	New York	Cleveland	Chicago
Abrasive disks, aluminum oxide No. 50 grain, cloth, 6-in. dia., X weight, in 150-disk lots, per 100	$3.48	$3.48	$3.48
Belting, leather, heavy	40–5%	40–5%	40–5%
Belting, rubber, trans., Grade 1	60–10–10%	60–10%	60–10%

Lumber — Per M ft., b.m., 12–16 ft. lengths, delivered, N. Y.

Crating — Southern pine:
1x4-in., sq. ed. $27.00 1x6-in. $24.00

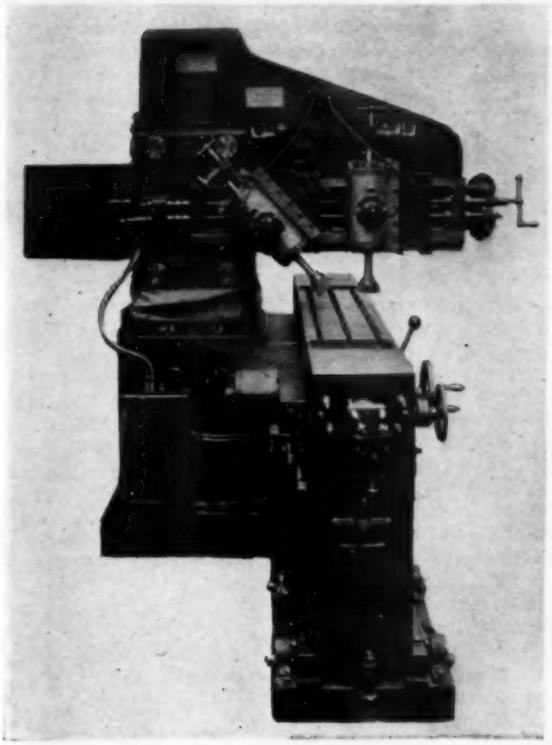
Skids — Spruce:
2x4-in. $35.00 3x4-in. $35.00 4x6-in. $37.00 6x6-in. $50.00



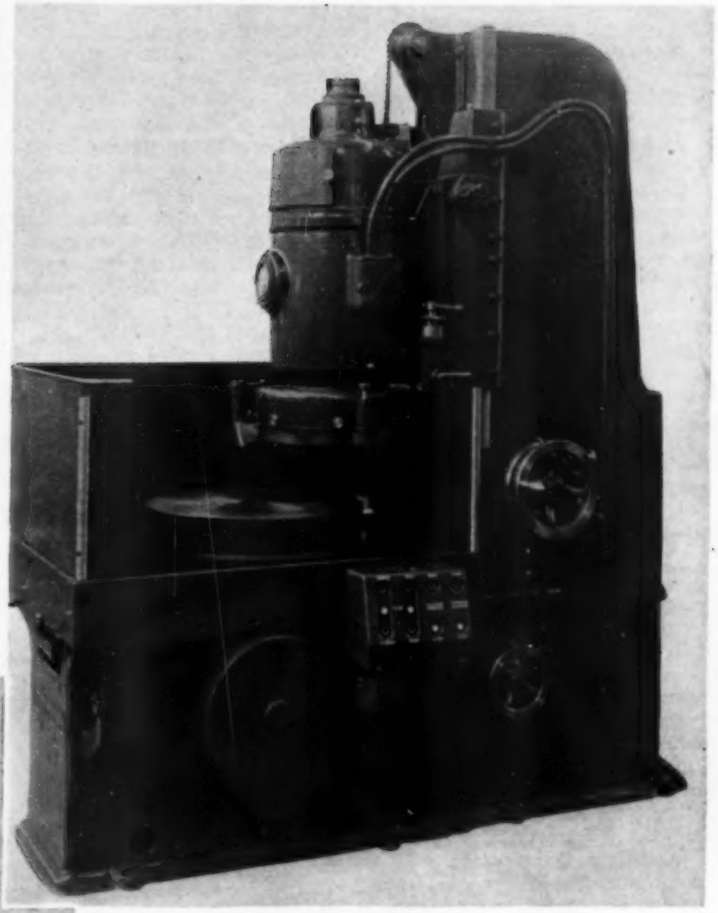
Price Movements Week by Week

Average Price of Raw Metals: Pig Iron, Billet Steel, Copper, Tin, Lead, Zinc—American Machinist
Seventy-Four Commodities Index—The Annalist

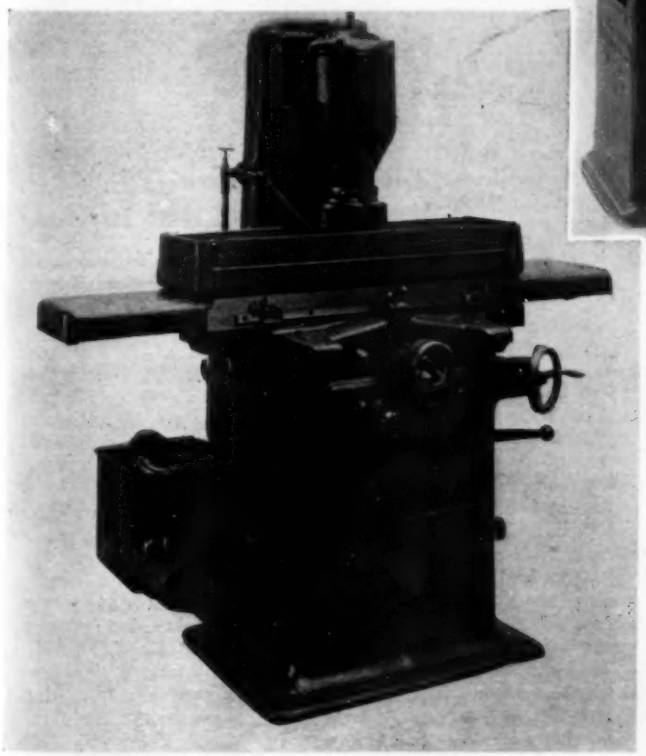
Metal-Working Machines at the 1932 Leipzig Spring Fair



Guide ways are completely ground on this machine, developed by Billeter & Klunz, Aschersleben. The vertically adjustable arm carries two swiveling motor-on-spindle wheelheads, which are set to the required angles by spirit levels. The arm travels on hardened steel ways, which are covered by bellows-shaped guards. Hydraulic table feed affords rates from 20 in. to 40 ft. per min. The bed, bolted to the baseplate, rests upon adjustable wedges so that misalignment can be corrected



Hydraulic table drive of this surface grinder provides variations of magnetic chuck speeds from zero to 30 r.p.m. The wheelhead is of the motor-on-spindle type. Automatic knock-offs control the rapid traverse movements of the slide. A pushbutton station, centrally located, gives control of all motors. The machine was exhibited by Billeter & Klunz



Approximately 75 per cent of the parts used in horizontal and vertical fully hydraulic surface grinders exhibited by Elbe, Werke, Herman Hailbig, A. G., Dresden, are interchangeable. Standardization of this sort permits manufacture in series to be effected. The hydraulically operated table is controlled both in its longitudinal and transverse movements by a novel vaive. Machines are built for surfaces up to 39x117 in.

Swope Plan Adopted by Electrical Manufacturers

WITH the adoption by the National Manufacturers Association of the unemployment insurance plan proposed by GERARD SWOPE, president, General Electric Co., the first concrete step toward unemployment security has been taken by an industry as a whole. The plan is said to be the first definite measure approved by a body of manufacturers to meet the obligation of employers to provide unemployment protection for employees. It recognizes the principle of mutuality, requiring both employers and employees to contribute to a common fund. All employees who have served twelve months, and whose full-time wages are not more than $2,500 a year are included in the scheme, which is officially known as the "NEMA Mutual Unemployment Benefit Plan." About 200,000 workers may be affected ultimately.

No employer may adopt the plan without the consent of at least 60 per cent of the workers affected. Every employee who comes under the provisions of the plan must contribute 1 per cent of his actual wage over a period of five years. Those whose earnings are less than half of normal are exempted. The company matches the contributions of its employees. Dues must be paid through six consecutive months before the worker is entitled to benefits.

Two unemployment conditions are recognized, normal and emergency. An emergency begins when payments from the fund exceed 2 per cent of the normal pay rate of all participating employees. Under normal conditions a participating employee after two weeks of unemployment, receives 50 per cent of his normal average earnings (but not more than $20 a week) for a period not exceeding ten weeks in any twelve months. Special provisions are made for part-time employment. With the announcement of an emergency, normal contributions and payments cease. All company employees, with the sole exception of those receiving 50 per cent of normal rate, must begin to contribute 1 per cent of their pay. Participating or non-participating, all workers must contribute.

Boyd Fisher Resigns as Machine Tool Association Manager

Announcement has just been made by R. M. GAYLORD, president, National Machine Tool Builders' Association, of the resignation of BOYD FISHER from the position of general manager of the association. The announcement goes on to say that association business is being carried on by the Cincinnati office under the direction of the board of directors pending selection of a successor to Mr. Fisher.

Manufacturers Support Commerce Department

The Manufacturers Association of Connecticut has offered its staunch support to the Bureau of Foreign & Domestic Commerce of the United States Department of Commerce. The prepared statement reads in part as follows: "This Bureau is the only bureau of the government department which is designed to aid business directly . . . Many of these departments spend comparatively enormous sums of money in the interests of certain groups of citizens, while the Bureau has an appropriation of but $5,000,000 out of the total of $50,000,000 appropriated for the Department of Commerce. It is actually the most productive, and in our opinion, the least wasteful of Federal departments, yet, as has been indicated, it is forced to operate its headquarters and 93 domestic and foreign offices on an inadequate $5,000,000.

"The Manufacturers Association of Connecticut is in a position to evaluate accurately the work of the bureau. Since the members of its staff are intimately acquainted with the details and operation of the Hartford (Conn.) cooperative office, they know the enormous savings which have resulted to Connecticut manufacturers. We have one example alone where a single act of one of the bureau's foreign offices saved a Connecticut factory $90,000 per year. The Association is in a better position to criticize or commend than many of the apathetic trade executives who have not had direct contact with the bureau's foreign representatives."

Most Machinery Lines Unprofitable

According to a report of May 27 by the Standard Statistics Co., Inc., most machinery lines are unprofitable. The report says: "During recent months, the most striking development in the industrial machinery trade has been the widening scope of downward readjustments in earning power to include those companies which previously had resisted the inroads of depression with better than average success.

"Lacking the stimulus of normal spring gains in new business, plant operations of industrial machinery companies are now approximating the lowest levels reached since the extreme depth of the post-war depression. Giving full consideration to the probability that existing demands for equipment represent the minimum of replacement needs, however, it is concluded that a broad bottom level of activity is currently being traversed by this industry. Nevertheless, lacking prospect of an early sustained advance in either sales volume or price schedules, practically all companies in the group will report large operating losses for the remaining months of 1932, at least.

"Renewed weakness in grain and livestock values unmistakably portend the continued restriction of farm machinery purchases. With agrarian buying power unlikely to improve materially during early future months, it is now apparent that aggregate sales of agricultural equipment in 1932 will establish new record low levels. Accordingly, it is believed that operations of manufacturers will remain of unremunerative proportions."

Protest Dumping Foreign Steel

The American Iron & Steel Institute has filed with the Treasury Department a complaint that foreign steel products are being dumped into this country from Belgium, France, Germany and Luxemburg at prices that are materially lower than prices at which the articles are sold for consumption in the country of exportation. This is said to be a violation of the Antidumping Statute of 1921, which is still in force. The Institute's complaint suggests that the extraordinarily low prices at which foreign steel products are being sold here, with all charges, duties, and even trucking included, indicate the possibility that the net yield must be less than the cost of production.

Tool Builders Protest Proposed Rate Increase

Machine tool builders in Cincinnati are deeply concerned over the announced intention of railroads east of the Mississippi and north of the Ohio and Potomac rivers to increase rates on machinery and allied products. The situation was placed before PRESIDENT W. F. WILEY of the Cincinnati Chamber of Commerce who telegraphed to the presidents of the railroads serving Cincinnati to voice the opposition of local interests. The replies received indicate that earnest consideration is being given to the question.

Under the railroad proposal the rates on machinery and related products will be increased about 27 per cent, or more than a fourth of present rates. To indicate more clearly the effect of this proposal it will be enough to show that there was an increase in rates on many commodities including machinery and

machinery parts on Dec. 3, 1931, and on Jan. 4, 1932 an emergency charge was added, both of which were on approval of the Interstate Commerce Commission. If the railroads insist upon putting through the present suggestion, it will mean that from Cincinnati to representative points there will be an advance of from 39 to 48 per cent above the freight rates paid prior to Dec. 3, 1931.

Light Weight Materials in Aircraft

MATERIALS used in aircraft construction were a prominent topic at the meeting of the aeronautic division of the American Society of Mechanical Engineers at the Buffalo meeting, June 6-8, 1932. C. F. NAGEL, JR., and G. O. HOGLUND outlined the advances made in aluminum alloys, from 25,000 lb. tensile strength in 1920 to 60,000 in 1931. They also announced that a new alloy to be known as 24S of the duralumin type is soon to be available. New aluminum alloy tubes are guaranteed to have a minimum yield point of 52,000 lb. per sq.in. Resistance to corrosion has also been considerably increased, some of the samples mentioned having been exposed to a 20 per cent salt spray for five years without injury.

Experience with the lighter alloys in various factories has produced workmen who now handle this material as easily as steel. Heat-treating in the fabricator's plant is being eliminated which reduces cost and insures maximum corrosion-resistance. The girders used in the construction of the dirigible, U.S. S. Akron were not heat-treated in the plant of the builder. Electric spot welding of aluminum alloys seems to be on its way, at least two planes having been built by this method. In both cases, spot welding was used in place of riveting in a large proportion of the joints.

According to the authors, the art has been advanced to a status warranting practical application in the industry which should greatly reduce fabricating costs.

GARDNER W. CARR outlined the practice of the Boeing Company in the production of metal planes. This company is probably the only one using the electric arc welding on tubing and other thin material, the claim being that this method localizes the heat and creates less disturbance in the whole structure than the gas welding method. It is admitted, however, that the electric welding of these materials requires greater skill on the part of the operator. Among the advantages of metal covering for control surfaces is the elimination of the dope and fabric work which were fire hazards and otherwise objectionable. On aluminum alloy members, however, riveting is used in the fabrication although bolts of duralumin also play an appreciable part.

A draw bench is being used extensively for forming sections from sheet stock in contrast with the usual method of using large presses or brakes. Originally purchased for the purpose of forming special streamline sections which were not then available, the use of this equipment has been largely extended. Wood shop operations have almost passed out of the picture. Of the heavier alloys chrome molybdenum SAE4130 is considered as offering the greatest possibilities in aircraft construction.

Mr. Carr feels that the available materials have been utilized as nearly to their limit as can be expected. On the other hand the question of large quantity production is as yet untouched. Other papers dealt with various forms of construction, with torsional vibration of aircraft engine crankshafts, standardization of stabilizer control and its air compression at high temperatures.

New England Industries Favor Sales Tax

The New England Council has announced the result of a recent poll taken among manufacturers to ascertain the number favoring the manufacturers' sales tax in the national program for balancing the Federal budget. The council has taken no position on this question but conducted this poll to establish facts as regards sentiment of New England manufacturers.

At this time more than 2,000 manufacturers have been asked to vote. All have not responded but all states favor the proposal by a one-sided ratio. By states Massachusetts is 11 to 1 in favor of the tax; Maine, 9 to 1; Vermont, 5 to 1; Rhode Island, 9 to 1; Connecticut, 6 to 1; and New Hampshire, 9 to 1. The New England Council states that indications to date favor a low-rate general manufacturers' sales tax. The Association of Industries of Massachusetts and Manufacturers' Association of Connecticut strongly favor the tax.

Free Trips to Leipzig Trade Fair

Free trips to the Leipzig Trade Fair are again offered to American buyers throughout the country. The expense of the round trip will be refunded at Leipzig as heretofore on the basis of orders placed at the Fair, which will be held from August 28 to September 1. The fair will include this fall some 8,000 exhibits of the newest products of every phase of human activity contributed by twenty-five countries. Information concerning the free trips to Leipzig and the opportunities for international trade at the Fair may be obtained from Leipzig Trade Fair, Inc., 10 E. 40th St., New York, N. Y.

Small-Shop Management Study

Management of small shops engaged in special manufacture, generally designated as job shops, is to be given intensive study by the Management Division of the American Society of Mechanical Engineers. Under the chairmanship of H. O. Mercier a special committee will analyze the production, control, and management schemes applicable to small-shop organizations, bringing together basic information of general value to all engineers engaged in such enterprises.

Machinery Exports Increase in April

Exports of power driven metal working machinery increased sharply in April as compared with March. April exports were valued at $1,118,110, while those in March aggregated $838,606. The April total fell slightly more than 50 per cent below the total for April, 1931. The detailed figures just released by the Department of Commerce are as in the table below.

	April, 1932	March, 1932	April, 1931
Engine lathes	22,987	46,385	116,068
Turret lathes	11,945	7,491	28,662
Other lathes	3,326	11,474	122,539
Vertical boring mills and chucking machines	12,345	13,262	51,482
Thread-cutting and automatic screw machines	35,390	22,354	21,234
Knee and column type milling machines	15,086	13,279	98,018
Other milling machines	61,056	42,171	112,879
Gear cutting machines	41,200	31,299	162,416
Vertical drilling machines	18,146	14,062	28,259
Radial drilling machines	.....	.....	50,934
Other drilling machines	118,309	46,079	108,529
Planers and shapers	7,575	16,425	33,653
Surface grinding machines	6,235	13,595	44,266
External cylindrical grinding machines	7,776	60,046	54,766
Internal grinding machines	15,738	4,735	7,579
Tool-grinding, cutter-grinding, and universal grinding machines	14,283	18,256	31,179
Other metal-grinding machines	47,668	46,663	52,441
Sheet and plate metal-working machines	243,921	46,316	193,392
Forging machinery	71,273	110,093	465,740
Rolling-mill machinery	192,521	28,494	146,415
Foundry and molding equipment	18,514	38,021	218,477
Other power-driven metal-working machinery and parts	152,812	208,106	313,993
Pneumatic portable tools	35,834	49,662	79,107
Chucks for machine tools	3,179	5,167	11,301
Machine-operated pipe and thread cutters, stocks, dies, taps, and other machine-operated cutting tools	73,795	68,591	61,774
Other metal-working machine tools	51,879	49,507	137,885

United States Unlikely to Go Off Gold Standard

Loss of confidence in United States currency by the American people themselves is the only eventuality which can cause the United States to depart from the gold standard, banking authorities are convinced. Withdrawals of foreign deposits cannot force the United States off the gold standard. If Americans should begin hoarding gold on a large scale, which is regarded as most unlikely, the country's present strong gold position could be undermined.

It would be a great relief to Treasury officials were the French to withdraw all of their deposits so that the American money market would not be affected constantly by French politics.

The gold curve shows that even with the heavy foreign withdrawals of the last few weeks, our remaining gold supply is greater than at any other time prior to 1923 and even greater than it was in 1928. This is the more remarkable in that prices are 30 per cent lower and bank credit is 25 per cent lower. The United States has more gold per dollar of bank credit than at any time except during the unusual peaks in certain recent years. The present gold supply is ample for a large expansion of business.

G. E. Employees Become Salesmen

Under a sales campaign which General Electric Co. will promote during June, all employees will become potential salesmen and saleswomen, according to an announcement by T. K. QUINN, vice-president. By interesting friends, neighbors and relatives to such an extent that an appointment can be made for a professional salesman to call upon the prospect, the employee becomes eligible for a 5 per cent commission on every article sold in this manner, provided each sale is closed before July 30. Sales are to be established at list prices, and eight home appliance products are on the list.

Canada Has Favorable Trade Balance

According to a review of conditions in Canada by the Bank of Montreal, it is said that the rains in the Prairie Provinces have improved crop prospects, and should these be realized there would be a general change for the better. Commodity prices remain unprofitably low, but the disparity between producers' and consumers' prices narrows slowly, thereby tending to restore an economic equilibrium. The conversion of an adverse balance of trade to a favorable one of about one hundred million dollars for the year ended March 31st has helped to check the discount on the Canadian dollar in New York. The budget presented at the Ottawa House of Commons on April 6th was remarkable for the fact that it contained no tariff changes, these being deferred until the Empire Conference in July has met and determined means and measures for the promotion of inter-empire trade.

French Quotas More Favorable

A moderation of the extremely rigid quota policy on American imports was effected as one of the last official acts of ex-premier Tardieu. This action was the outcome of recent negotiations between Ambassador Walter E. Edge and the French government.

Total benefits to American business amount to $500,000 annually. Important increases are those for radio sets of 20 per cent, or $64,000; radio tubes 45 per cent, or $54,000; and radio tools 45 per cent, or $52,000. Patent leather products, electrical machinery, paper and lumber are also affected.

The agreement is temporary but will remain in effect until a full commercial treaty covering all phases of international trade is negotiated between the two countries. Following the abolition of the French double tax on American imports, this action leads to the hope that a more tolerant policy on quotas may be followed by the new government.

New Theory of Lubrication

As an outcome of the work of the Lubrication Engineering committee of the A.S.M.E., a new thoery of the mechanism of lubrication has been developed and was presented to an informal conference at the Engineering Society Building on June 1.

The practical importance of this theory lies in the fact that it proposed novel bases for the evaluation of the lubricating properties of oils and greases and incidentally offers an explanation for a number of matters that have been puzzling lubrication engineers in the past. The development of this theory has been made possible by discoveries of new features in the behavior of lubricants which in turn have been made possible through tests made on a new machine for investigating phenomena of lubrication erected by the Sperry Gyroscope Company.

The new theory of lubrication offers factual support for the discoveries of German investigators, such as Viewig, to the effect that lubricating properties of oil as such are not determined by the viscosity of the oil. It also offers experimental proof of the correctness of Langmuir's theory under which a layer of lubricant one molecule thick is held by chemical forces at the face of the metal, as well as the theory of French investigators supported by Sir J. J. Thomson, the famous British physicist, to the effect that a comparatively heavy layer of oil is held to the face of the metal by electrical or magnetic fields.

With the new machine, not only has the actual presence of these layers been confirmed but the lubricant has been found to peel off layer after layer. It has been further discovered that we finally reach an "ultimate" layer which does not peel off, even when enormous disruptive forces have been applied to it.

Another startling discovery has been that if the ultimate layer is wiped off the face of the metal a new layer of lubricant is immediately created thereon and, for example, in the case of a steel lubricated surface, as many as 21 layers of oil have been wiped off where the presence of even a single fluid layer has never been suspected before.

With these and certain other facts as a foundation, a new picture of the mechanism of lubrication has been built up. Briefly, according to this theory, a layer of oil is formed on the surface of the metal, the thickness and strength characteristics of this layer being determined by the character of the lubricant, and the character of the metal. This layer, in turn, pumps up under an enormous pressure of oil into the crevices of the metal.

Iron and Steel Electrical Engineers To Meet June 20-23

The Association of Iron & Steel Electrical Engineers will hold its annual convention and exposition at the William Penn Hotel, Pittsburgh, Pa., June 20-23. The papers of interest, to be presented Monday, June 20, are as follows: "Electrical Development in the Iron and Steel Industry," by W. H. BURR, electrical superintendent, Lukens Steel Co.; "Progress in the Electrical Welding Science," by G. E. DOAN, associate professor, Lehigh University; "Substitution of Fabricated Steel for Castings," by W. E. WATSON, Youngstown Welding Co. On Thursday there will be an open discussion on "Gear Transmission." Technical sessions will be held by the mechanical, electrical lubrication, combustion and safety engineering divisions of the association.

Tool Engineers To Meet June 9

The American Society of Tool Engineers, 8316 Woodward Ave., Detroit, Mich., states that the next regular meeting of the Society will be held June 9 at the Detroit-Leland Hotel. FRANK CURTIS, research engineer, Kearney & Trecker Corp., will speak on the subject of "What Tool Engineers Should Know About Tungsten-Carbide." LOUIS RUTHENBURG, president and general manager of Copeland Products, Inc., will speak on the subject "The Relation of the Tool Engineer to Management."

THE BUSINESS WEEK

June 8, 1932

The general level of production and trade, such as it is, has not shown any marked change in the past three months, after allowing for usual seasonal factors . . . A similar stability during the Spring period was evident in the two preceding years; but business was then at a much higher level, and the possibilities of further decline from the present position would seem to be considerably smaller . . . Commodity prices are still falling, but more slowly and with some scattered signs of stabilization in specific instances . . security markets still ruled by panic psychology, have not yet reflected these symptoms, but they rarely or never do . . . Financial sentiment has been somewhat steadied by speedier congressional action on fiscal issues, but is nervous about prospective European political developments . . . Although Federal Reserve efforts to stimulate speedy credit expansion have been ineffective and are marking time, improvement in the banking position continues steadily as short-term funds pile up in money centers pending return of investment confidence . . . No one can say what additional jolts to business and financial sentiment the merry month of June may hold in store at home or overseas, but the jittering capacity of the public would seem to be approaching exhaustion, and a cyclical return of common sense about due to set in as soon as Congress adjourns and the political pandemonium of the campaign is past.

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BUSINESS ITEMS

Sale of the assets of American Steel Dredge Co. by WALTER WALB, receiver, has been ordered in superior court at Fort Wayne, Ind. The receiver was instructed to sell the assets at not less than the appraised value of $36,453.88.

Articles of incorporation have been filed with the secretary of state of Indianapolis by Gohmann Foundry Co., Inc., New Albany, Ind. The foundry will have a capital stock of 50 shares of no declared par value, and the first board of directors is composed of LEON H. GOHMANN, A. MAURICE GOHMANN and MARY A. GOHMANN.

Announcement is made of the formation of Paranite Wire & Cable Corp., which has taken over the property formerly belonging to the Indiana Rubber & Insulated Wire Co., Jonesboro, Ind., the latter having been in receivership. A. E. HOLTON is president of the new company and J. G. SEARLS is vice-president and general manager.

Articles of incorporation have been filed with the secretary of state in Indianapolis by Superior Body Co., Inc., Marion, Ind., formed to manufacture dump bodies for trucks. Incorporators are JOHN A. SHUE, HARRY GOLDTHWAITE, H. W. HOOPER, FRANK X. GARTLAND and MARSHALL WILLIAMS.

A public sale of the real estate and personal property of Bryant Electric Refrigerator Corp., New Milford Borough and New Milford Township, Susquehanna County, Pa., will be held on Wednesday, July 6, 1932, at 10 o'clock. The sale will include machine tools and production equipment.

Appointment of BRUCE V. KELLER as advertising manager of Aluminum Industries, Inc., was announced by W. E. MCILROY, director of distribution. Mr. Keller succeeds R. C. GLANDORF, who has been transferred to the Chicago district as assistant to O. E. VAN ALTENA, district manager of Chicago. Mr. Keller comes to Aluminum Industries from Timken Roller Bearing Co.

Amalgamation of Red River Products, Ltd., manufacturer of heating, ventilating and air-conditioning equipment, with Kipp-Kelly, Ltd., machinery manufacturer, has been completed in Winnipeg, and negotiations for Canadian manufacturing rights of a large American fan company have been concluded.

Ohio Electric Mfg. Co., 5900 Maurice Ave., Cleveland, Ohio, has appointed C. SAM SWANSON, 1616 Kresge Bldg., Detroit, Mich., as representative for its 1/50 to 1 hp. fractional electric motors. G. R. HORNE will continue to represent the Ohio company for the sale of its lifting and separation magnets.

Advance Pressure Castings, Inc., 34-48 N. 15th St., Brooklyn, N. Y., has been organized to produce die-castings in zinc and aluminum alloys. The organization has obtained the services of key men of the former Allied Die Casting Corp. as follows: W. JENSEN, works manager, formerly chief engineer of Allied Die Casting and prior to that chief engineer and plant superintendent of Newton Die Casting Co.; ALFRED RUSCH, R. ZALESKI, F. DERTINGER, and H. BONZAK.

According to a recent announcement made in Vancouver by CAPT. E. AIKMAN, superintendent of Canadian Pacific steamship fleet on the Pacific, four Empress liners will be drydocked for summer overhaul at Escuimalt, Vancouver Island, instead of at Hong Kong.

Driver-Harris Co., Harrison, N. J., has been licensed by International Nickel Co. to melt and fabricate the corrosion-resisting alloy, "Ni-Resist." Inasmuch as Ni-Resist is resistant to moderately high temperatures it is supplementary to "Nichrome" and other high-temperature alloys made by the company.

Sargent & Greenleaf, Inc., Rochester, N. Y., has taken over the assets, stock, tools, machinery and patents of Marproof Products, Inc., New York, according to an announcement by W. R. HILL, president. The products of Marproof Products, Inc., comprise a line of leg sockets for desks, tables, and stands.

Gear Processing, Inc., formerly located at 79 Bethune St., West, Detroit, Mich., has been moved to 6700 Grant Ave., Cleveland, Ohio, because larger quarters were imperative.

Acquisition of Construction Machinery Co., Waterloo, Iowa, has been announced by PHILIP L. BRYANT, president of Bryant Paving Co., which will continue its operation under that name.

National Acme Co., Cleveland, Ohio, has announced the appointment of FRANK A. SPENCER as district manager of the Detroit territory at 2826 E. Grand Blvd. Mr. Spencer has had many years of experience in the company's various lines, and goes to Detroit from the Ohio district.

Bastian-Blessing Co. stockholders at a special meeting, June 15, will vote on a proposal to acquire the business and property of Russ Mfg. Co., Cleveland, and change the authorized capital of the company necessary to complete the acquisition.

American Cyanamid Co., New York, N. Y., has appointed the Case Hardening Service Co., Cleveland, as its exclusive distributor in northern Ohio for hardening materials.

Bonney Forge & Tool Works, Allentown, Pa., has appointed D. H. Skeen & Co., Chicago, as its distributor for Weldolets and Thredolets, fittings for welded pipe lines, in the Chicago district. Stock will be carried.

Poole Foundry & Machine Co. has been organized to conduct the former

business and plant of Poole Engineering & Machine Co. with general offices and works at Woodberry, Baltimore. F. T. BRADY is president, F. T. BRADY, JR., vice-president, and L. M. RICKETTS, secretary and treasurer.

A dividend of $0.25 was declared by Yale & Towne Mfg. Co., payable July 1. Like dividends were paid in two preceding quarters.

Niles-Bement-Pond Co., New York, has omitted the dividend on the capital stock due at this time. Three months ago a $0.15 dividend was declared, and in the three preceding quarters $0.25 a quarter was paid.

The Babcock & Wilcox Co., builder of boilers, is understood to have arranged to transfer operations of the Bayonne, N. J., plant to its Barberton, Ohio, plant, and to close down the former.

Beck Engineering Combustion Co., St. Louis, has been organized to manufacture a low-pressure gas burner. V. S. BECK is president.

Fairbanks, Morse & Co. has moved and consolidated its Boston and Cambridge facilities, and now the offices, repair department and warehouse are at 178 Atlantic Ave., Boston.

Squardee Sash Mfg. Co., St. Louis, has been organized to manufacture a patented window sash, and plans to build a $25,000 plant. CHARLES DRILL is president.

The Despatch Oven Co., Minneapolis, has appointed E. H. SEELBACH, 381 Ellicott Sq., Buffalo, as its district engineer in charge of sales and engineering in the western part of New York, including Rochester and Erie, Pa.

Borst Engineering Corp., Buffalo, will move its metals specialties business to Angola, N. Y., about July 1.

General offices and plant of the Mallory Electric Corp. have been moved from Toledo to Detroit. The new address is Vancouver Ave. and P.M.R.R.

John E. Livingston Co., General Motors Bldg., Detroit, has been appointed sales agent by Robbins & Myers, Inc., for hoists and cranes.

Allis-Chalmers Mfg. Co. has received a $100,000 order for tractors and trailers from the Near East Development Co., and another order for like amount for Mississippi levee construction programs.

Gilby Alloy Co. has been organized at Newark, N. J., with offices at 850 Mt. Prospect Ave. WALTER GILBY, formerly of the Gilby Wire Co. and Driver-Harris Co., is president. The company will manufacture filament ribbon and resistance wire.

Ferro Enamel Corp., Cleveland, has added a design-counsel service. It will be in charge of R. GUY COWAN.

• PERSONALS •

LEON P. ALFORD, vice-president of Ronald Press Co. and well known for his writings on management, will receive the honorary degree of doctor of engineering from Worcester Polytechnic Institute, June 17.

A. CLARK MOORE, executive vice-president of Chicago Railway Equipment Co., has been chosen vice-president to succeed the late E. B. LEIGH. W. F. OPPENHEIM was elected vice-president.

HOWARD DINGLE, president of Cleveland Worm & Gear Co., has been elected president of Farval Corp., Cleveland, which was formed recently for the manufacture and sale of the Farval centralized system of lubrication formerly manufactured by Lubrication Devices, Inc., Battle Creek.

EDWARD T. FOWLER has resigned as treasurer and manager of Foster Machine Co., manufacturer of textile machinery, Westfield, Mass., to take effect July 1. He has been with the concern 32 years.

GEORGE A. GREEN has been advanced from the position of vice-president in charge of engineering of General Motors Trucks Co., Pontiac, Mich., to that of vice-president in charge of operations. He will also remain in charge of engineering work of the company.

C. H. KIRBY, executive chief engineer of the Marvel Carburetor Co., has been appointed vice-president in charge of engineering, according to GEORGE TAFT, president.

EDWARD H. KOCHER, formerly treasurer and general manager of Bijur Lubricating Corp., Long Island City, N. Y., was recently elected president and general manager.

W. LAURENCE LE PAGE, vice-president of Kellett Aircraft Corp., Philadelphia, and chairman of the Philadelphia Section, S.A.E., was recently appointed by the Franklin Institute of Pennsylvania as a member of its committee on sciences and art.

F. L. LINDEMUTH has been appointed chief engineer of the William B. Pollock Co., Youngstown, O. Mr. Lindemuth was formerly connected with the Mesta Machine Co.

CLEMENT V. MCKAIG, vice-president in charge of sales, Great Lakes Steel Corp., Detroit, has been named to succeed C. G. WOOD as vice-president and general manager of sales, Carnegie Steel Co., Pittsburgh. Mr. McKaig went with Carnegie Steel Co. in 1908 and has been employed there continuously in various capacities.

WILLIAM J. MEINEL has resigned as vice-president in charge of operations of the Edward G. Budd Mfg. Co. to become vice-president and general manager of the Heintz Mfg. Co.

WILLIAM WESTERVELT NICHOLS was the recipient of an honorary degree of mechanical engineer from the University of Detroit recently. The citation reads in part "an outstanding figure in the profession of mechanical design, creative engineering and industrial management; and for his additions to the literature of industrial management and problems of industrial control."

W. R. PHIBBS, general manager of Columbia Steel Co., Ironton, has been promoted to the general managership of all plants of the company. C. T. KEIGLEY, plant superintendent, will succeed Mr. Phibbs as general manager of the local plant.

P. B. ROGERS, was recently elected vice-president in charge of engineering and also a member of the board of directors of Great Lakes Aircraft Corp., of Cleveland. His previous position was that of chief engineer.

ALOIS H. SCHMAL has relinquished his position as executive engineer with International Motor Co., New Brunswick, N. J., and is now connected with S K F Industries, Inc., New York City, and is in charge of the automotive division of the engineering department.

ADOLF G. SCHNEIDER, who was chief designer of J. H. McCormick Co., Williamsport, Pa., is now connected with Northern Pump Co., Minneapolis.

W. E. SIMMONS of Fargo, N. D., has gone to Milwaukee to take over the management of the Ford assembly plant there. He succeeds L. T. HENDERSON, resigned.

JAMES S. WATSON, vice-president of Link-Belt Co., in charge of the company's Dodge Works in Indianapolis, has been made vice-president and general manager of the company's two chain factories in that city—the Dodge and the Ewart Works.

THEODORE A. WELLS, who was project engineer for Curtiss Wright Airplane Co., Robertson, Mo., has been appointed chief engineer of Beech Aircraft Co., Wichita, Kan.

Burlingame Dies Brown & Sharpe Executive

LUTHER D. BURLINGAME, who for many years was a leading figure in Providence civic affairs, and who was industrial superintendent of the Brown & Sharpe Manufacturing Co., died on June 2. He was 67 years old and had been ill only a short time.

Mr. Burlingame was born in Whitestown (now Whitesboro), N. Y., January 12, 1865, and was educated in the

schools of Dover, N. H., and Providence. He entered the employ of Brown & Sharpe Mfg. Co. as an apprentice in the drafting department, Sept. 18, 1884, serving time both in that department and in the machine shop. He was made chief draftsman in March, 1888, when there were 14 employes in the drafting department, and continued as chief draftsman for more than 25 years, seeing the department grow to more than 100 employes by September, 1914.

Mr. Burlingame later became industrial superintendent, chairman of the safety committee, and specialist in patent work, in which he was much occupied to the last. For many years he represented the company in numerous technical societies, especially in the work of the American Society of Mechanical Engineers, where he held responsible assignments. He was an organizer of the Providence Engineering Society, and was long its president. For many years he was a director of the Providence Chamber of Commerce and president of the Safety Council.

• OBITUARIES •

GEORGE C. BRAMLAGE, secretary and treasurer of Fred J. Meyer Wire Goods Mfg. Co., Hamilton, Ohio, died in Cincinnati recently. He was 75.

HUGH CHALMERS, Detroit, retired automobile manufacturer, died June 2. At 14, Mr. Chalmers went to work for National Cash Register Co. and when he was 27 was made vice-president and general manager. In 1907 he resigned and bought an interest in E. R. Thomas-Detroit Motor Co., of which he became president and changed the name to Chalmers-Detroit Motor Co., and later to Chalmers Motor Co. Other companies in Detroit with which he was associated during his career as a manufacturer were Hudson Motor Car Co., Fairview Motor Co. and Michigan Cash Register Co.

LUMAN CATLIN COLT, formerly general manager of Strong Mfg. Co., Winsted, Conn., died May 27, aged 83. He entered the employ of the company in 1897 and succeeded his brother as general manager.

JOHN C. CROMWELL, a former president of Alliance Machine Co., and the organizer and general manager of Steel Sanitary Co. of Alliance, died recently in Columbus.

GEORGE H. HANNUM, general manager of G. M. Heintz Mfg. Co., Philadelphia, died recently. Mr. Hannum started his career in the automobile industry in 1907 with Autocar Co., Ardmore, Pa., as chief inspector. From 1908 to 1912 he was superintendent in charge of manufacturing for Detroit Lubricator Co. For the following eight years he was general manager of Saginaw Products Co., Saginaw, Mich. In 1920 he was elected president and general manager of Oakland Motor Car Co., Pontiac, Mich., a position which he filled until about 1926, when he was elected president and general manager of Hannum Co., Milwaukee. Following the sale of the latter company in 1930, Mr. Hannum joined Heintz Mfg. Co. in 1931.

WILLIAM E. HITCHCOCK, 73, vice-president and director of Warner Gear Co., Indianapolis, died recently.

JULIAN KENNEDY, head of a consulting engineering firm engaged in design and construction of steelworks and blast furnaces, died May 28. Mr. Kennedy was considered to be an authority and besides numerous projects in this country was retained on foreign developments. He was a member of several societies.

HOWARD E. MAYNARD, assistant chief engineer, Chrysler Corp., died May 12 in Detroit. Born at Amherst, Mass., in 1879, and technically educated at the Massachusetts State College and the Worcester Polytechnic Institute, Mr. Maynard entered the automobile industry in 1910 as assistant engineer of United States Motor Co., Detroit. In 1913, as production engineer, he was placed in full charge of production for Maxwell Motor Co., of Detroit. By 1921 he had been advanced to the position of assistant executive manager of the company, and after taking over of Maxwell Co. by Chrysler Corp., he was appointed assistant chief engineer of the latter organization.

FREDERICK MCCLAIN, 69, chief engineer of the firm of Julian Kennedy, Pittsburgh, prior to his retirement in 1927, died May 22 while on a visit to London.

CHARLES A. NORDYKE, 65, son of the founder of Nordyke & Marmon Co., Indianapolis machinery maker, and later manufacturer of automobiles, died recently at his home in Indianapolis.

JOSEPH OBENBERGER, pioneer drop forge specialist of Milwaukee, died recently. He established Joseph Obenberger & Son Co., in 1902.

F. S. OVERTON, for the last 30 years secretary and a director of the Ingersoll-Rand Co., died June 5 from a heart attack while bathing in Long Island Sound.

GEORGE W. PAGE, 51, vice-president in charge of purchases and director of the W. A. Jones Foundry & Machine Co., and with the company for 33 years, died recently.

CHARLES REESE, for 42 years superintendent of the armor-plate department of the Bethlehem Steel Co., died June 5. He was 62 years old.

JAMES A. SEBASTIANI, 77, formerly secretary and treasurer of Cincinnati Iron & Steel Co., died May 30. Mr. Sebastiani was first employed by Mitchell Tranter Rolling Mill Co., later becoming secretary and treasurer. In 1902, he organized Cincinnati Iron & Steel Co., which was sold to Joseph T. Ryerson Sons, Inc., in 1923.

JOHN H. TRIMBLE, 75, president of Trimble & Fink, Baltimore, Md., machinists, died in Baltimore on May 30.

JOHN E. ULLMAN, founder and president of the Syracuse Chilled Die & Casting Co., Inc., Syracuse, N. Y., died of a heart attack at his home in that city June 1. A native of Sweden, he came to the United States when 16 years of age. In 1908 he came to Syracuse and organized the company of which he was president.

EDMUND H. WALKER, 60, president of the Walker Draft Gear Co., died recently. He was president of the Railway Business Men's Association and also of the Bradford Corp.

GEORGE E. WELLS, an engineer of American Brass Co., Waterbury, Conn., for 25 years, died May 26 in an automobile accident.

G. HERBERT WHITTINGHAM, chairman of the board, Monitor Controller Co., Baltimore, died June 4 at 65. He entered the electrical industry in 1888 and was one of the early pioneers in electrical development.

• MEETINGS •

AMERICAN SOCIETY OF MECHANICAL ENG'RS
Second National Applied Mechanics Meeting, Yale University, New Haven, Conn., June 23-24-25.
Semi-Annual Meeting, Bigwin, Canada, June 27-30.
National Machine Shop Practice Meeting, Buffalo. Week of Oct. 3. Calvin W. Rice, secretary, 29 W. 39th St., New York, N. Y.

SOCIETY OF AUTOMOTIVE ENGINEERS
1932 summer meeting, Greenbrier Hotel, White Sulphur Springs, W. Va., June 12-17. John A. C. Warner, secretary, 29 W. 39th St., New York, N. Y.

AMERICAN INSTITUTE OF ELECTRICAL ENG'RS
Summer Convention, Cleveland, O. June 20-24. H. H. Henline, Assistant National Secretary, 33 W. 39th St., New York, N. Y.

AMERICAN SOCIETY FOR TESTING MATERIALS
Annual meeting, Atlantic City, June, 20-24. R. E. Hess, assistant secretary, 1315 Spruce St., Philadelphia, Pa.

NATIONAL METAL CONGRESS & EXPOSITION
174th Regiment Armory, Buffalo, N. Y., Oct. 3-7. Sponsored by A.S.S.T., with cooperation of A.S.M.E., Institute of Metals and Iron & Steel Divisions of A.I.M.E., A.W.S., and the Wire Association. W. H. Eiseman, 7016 Euclid Ave., Cleveland, Director.

MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

Opportunities for Future Business

Ia., Oelwein — The Chicago Great Western Railroad, announced plans for remodeling and enlarging shops, here. Estimated cost $150,000.

La., Shreveport—Allen Lumber Manufacturing Co., plans reconstructing plant. $60,000. Maturity indefinite.

Me., Fort Williams—U. S., Office of Q. M., Fort Williams, cancelled bids for steel garage No. Q M 963-32-17.

Mich., Dearborn—Ford Motor Co., Dearborn, awarded contract for the construction of a 1 story garage building. Estimated cost is $40,000.

N. J., Clinton—Starnas Bros., c/o Poggi & Bragdon, 275 Morris Ave., Elizabeth, rejected bids for construction of a 1 story, garage and salesroom here. Estimated cost $40,000.

N. J., Grantwood—Cliff Motor Corporation, 508 Anderson Ave., having preliminary plans prepared for construction of a 1 story, garage at Anderson St. and Kearny Ave. R. J. Cadieu, 545 Gorge Rd., Grantwood, is architect.

N. J., Hoboken—R. B. Davis Co., 38 Jackson St., having plans prepared for the construction of 1 story, 125 x 200 ft. manufacturing plant at Jackson St.

N. J., Newark—Baker & Co., 54 Austin St., awarded general contract for construction of 1 story Sweeps building for platinum plant, 116 Murray St. Estimated cost $40,000.

N. J., Newark—Standard Oil Co. of New Jersey, 26 Bway., New York, awarded general contract for the construction of a 1 story, 90 x 100 ft. auto service station at Runyon St. and Elizabeth Ave. Estimated cost $40,000.

N. J., Oceanport—Construction Q. M., E. P. Antonovich, Fort Monmouth, having plans prepared for the construction of a 2 story officers' quarters and garage buildings at Fort Hancock. Estimated cost $150,000.

N. Y., Brook'yn—M. Freidman, 236 Montgomery St., having preliminary plans prepared for the construction of a 1 story, 109 x 120 ft., service garage and gas station at Utica Ave. and Winthrop St. Estimated cost exceeds $40,000. S. L. Walkind, 93 Court St., is architect.

N. Y., Brooklyn—Nakoma Realty Co., 108 Jewel St., having plans prepared for the alteration and extension of a 2 story service garage and loft building at Frost and Leonard Sts. J. J. Millman, 191 Joralemon St., is architect.

N. Y., Brooklyn—G. Sorrentino, 115 Navy St., taking bids general contract for construction of a 2 story, 25 x 100 ft. garage and storage building at Navy and Johnson Sts. D. Salvati, 369 Fulton St., is architect.

N. Y., Dobbs Ferry—Bd. Educ., Dobbs Ferry, received bids and will award contract this month, for high school with manual training facilities. Estimated cost exceeds $800,000.

N. Y., New York—A. Farber, 302 Madison Ave., having plans prepared for the construction of two 36 x 40 ft. service and repair garage buildings, at 302 Madison Ave., rear. P. Bordes, 230 Grand St., is architect.

N. Y., New York—J. Garufi, 2736 Seward Ave., will take general and separate contract bids late in July, for the construction of a service garage at Homer and Havemeyer Avenues.

N. Y., New York—Edlar Realty Corporation, 202 West 76th St., R. Calder, pres., having plans prepared, and takes bids general contract, in October, for the construction of a 1 story, service garage at Intervale Ave. and 169th St. M. T. Keltz, 51 Chambers St., is architect.

N. Y., Woodlawn — Krausahr & Oldus, 16 Court St., Brooklyn, having plans prepared for the construction of a 1 story, 53 x 108 ft. service garage at Metropolitan Ave. and 126th St. Lama & Proskauer, 383 Jay St., Brooklyn, are architects.

Okla., Muskogee — Bacone College, B. D. Weeks, pres., plans construction of a school to include industrial arts building, northeast of City. Estimated cost $150,000.

Pa., Pittsburgh—J. Kenny Transfer Co., 101 Carson St., plans rebuilding garage and terminal, storage and service building, at Murtland Ave. and Lynn Way. Maturity indefinite. Estimated cost to exceed $45,000. Architect not appointed.

R. I., Providence — State Airport Comn., Cranston, having plans prepared for construction of an administration building and equipment at Rhode Island Airport.

S. C., Orangeburg — Bamberg Lumber Co., Orangeburg, plans reconstruction and repair of lumber plant recently damaged by fire. Estimated cost exceeds $100,000. Maturity indefinite.

Tenn., Memphis—Frank and Edward Thompson, owner, and Kinzer Bros. Trucking Co., and Ed. Edwin Service Station, lessees, Jefferson, Lauderdale and Adams Sts., plan rebuilding trucking, service station, etc., recently destroyed by fire. Estimated cost is $90,000

Va., Morrison—Mariners Museum, c/o Homer L. Ferguson, Newport News Shipbuilding & Dry Dock Co., Newport News, having plans prepared for the construction of an outdoor museum on 850 acre tract, to include shop for building model ships, reproductions, etc. Estimated total cost is $10,000,000.

Wis., Combined Locks — Combined Locks Paper Co., awarded contract for construction of a 1 story basement, 60 x 180 ft. and 48 x 72 ft. paper mill unit.

Wis., Kaukauna — Niesen Pulp Company, Kaukauna, plans rebuilding 2 paper pulp manufacturing plant structures, recently destroyed by fire.

Ont., Niagara Falls — Kimberley Clark Co., Neenah, Wis., taking bids until June 13, for construction of 2 story, 115 x 179 ft. factory, Victoria Ave., for Kotex Company of Canada, Ltd., 554 Queen St.

Ont., St. Catharines—Corporation, c/o Lennox Furnace Co. Ltd. of Canada, Terminal Warehouse Bldg., Toronto, plans construction of furnace manufacturing plant. Estimated cost exceeds $40,000.

Ont., Weston—Rudolph Motor Truck Co., plan construction of a plant. Estimated cost $25,000.

Union Soviet Socialistic Republic of Russia—c/o Amtorg Trading Corp., 261 5th Ave., New York, plans construction of a plant for fabrication and manufacture of standardized dwellings and furniture for same, to incl. saw mill, furniture factory, carpentry divisions and assembly department, at Leningrad. Estimated cost exceeds $1,000,000.

Equipment Wanted

D. C., Wash.—Bureau of Supplies and Accounts, Navy Dpt., will receive bids until July 14 for furnishing machine tools, taps, dies, threading tools, etc., for Naval Supply Depot, Brooklyn, N. Y.

Pa., Pittsburgh—Bd. Public Education, Administration Bldg., takes bids until June 14 for machine shop equipment for Westinghouse High School, twelve 13 in. x 5 ft., motor driven engine lathes and one 13 in. x 5 ft. engine lathe.

Michigan—State Hy. Dpt., at office Materials and Equipment Division, State Office Bldg., Lansing, will receive bids until June 15 for one 15 ton industrial railroad crane, 50 ft. boom; one 18 ton O & S gas railroad crane, 50 ft. boom; 342 Lakewood Model 253B industrial cars, 24 in. gauge; one 20 ft. Ord finishing machine; 1 Austin Rip-snorter, 9 ft. moldboard; five 20 ft. and one 10 ft. Wilder Strong Joint holders; 1 Carroll Jameison lathe, 14 in. swing, 3 ft. bed; 1 Moritz shoulder machine, 10 in. blade; 1 Model T-O & S ¾ yd. crane.

Ont., Hamilton — United Carr Fastener Co., Beach Rd., H. S. Beddoe, mgr., has completed negotiations for manufacturing products of the Dudley Lock Co. of Chicago, Ill., in Canada, and will install special equipment for manufacture of locks, padlocks, locker locks, etc.

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OPPORTUNITIES

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